

BROADBAND GAPS IN EL PASO COUNTY AND ECONOMIC IMPACTS OF CLOSING THEM



HUNT INSTITUTE
FOR GLOBAL COMPETITIVENESS

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Executive Summary

The COVID-19 pandemic exposed gaps in broadband access across the country. Such gaps may limit individuals' ability to access vital services such as telework, telehealth, and remote education. The El Paso Community Foundation (EPCF) and the University of Texas at El Paso (UTEP) partnered together to study broadband access in El Paso County, highlight the costs and benefits of expanding broadband access within the region, and consider various roles that the county government may play in such expansion programs. The project was funded by a grant allocated to El Paso County through the Coronavirus Aid, Relief, and Economic Security (CARES) Act.

The goal of the present report is two fold. First, data and analysis from household and business surveys conducted by the Hunt Institute are reported. The survey data are used to assess the current state of internet usage, identify the limitations that households and businesses face while using internet services in El Paso County, and to gauge consumer sentiments regarding the county government's involvement in broadband expansion programs. This survey data is complemented by detailed information gathered through focus group discussions and through the mapping of current broadband infrastructure in El Paso County. This information helps identify the typical requirements of users in the region and to identify high-need areas.

The second goal of the report is to assess the likely economic impact of expanding broadband infrastructure in El Paso County. The Hunt Institute conducted the economic impact analysis using the Impact Analysis for Planning (IMPLAN) software and cost estimates that were provided in a related report by the Mike Loya Center: "Broadband Expansion Business Plan: Fiber-to-the-Premises Plan for El Paso TX" (October, 2021).

Key findings from the residentail surveys, business surveys, and economic impact study are summarized below.

Residential Survey Key Findings Summary

82.7% of the household survey respondents reported having access to the internet, while 17.3% reported not having internet in their homes. Out of those households that reported having internet, 31.5% did not meet the Federal Communication Commission's (FCC) minimum requirements for broadband services. Therefore, 56.7% of the household survey respondents reported having broadband services, which is in sharp contrast to the 96.8% figure that would have broadband access as reported by the FCC.¹

¹ The FCC estimates 99.5% of El Paso County's urban population meets the minimum broadband standards, compared to only 53.8% of the County's rural population. Considering FCC estimates and given the County population distribution between urban (96.5%) and rural (3.5%) residents, El Paso County would have a 96.8% share of the total population with broadband access. It is unclear whether FCC broadband access data refers to the share of the population with broadband service access or with the ability to access broadband services.

Out of those households that reported not having internet, roughly 60% were from the eastern regions of El Paso County, with 36.6% from the East region and 20.7% from the Lower Valley region.

Two main internet providers account for a market share of nearly 90% for home computers, laptops, tablets, and TVs in El Paso County: Spectrum (58.6%) and AT&T (29.4%). In terms of the quality of internet services across all providers, 20.2% of all households rated their internet connection as excellent, 41.7% rated their connection as good, 29.2% rated it as average, and 8.9% reported poor home internet connection.

Business Survey Key Findings Summary

Over 90% of the business survey respondents reported having access to the internet, while 8.2% reported not having internet service for their business. Half of the total business respondents that reported having no internet reside in the eastern regions of El Paso County, with 37.5% in the East region and 12.5% in the Lower Valley region. Nearly a fifth (19.8%) of business survey participants reported download and upload speeds that did not meet the FCC's minimum requirements for broadband. With a 46.0% market share, Spectrum was reported as the main internet provider for most business computers, laptops, tablets, and TVs. AT&T followed with 27.0% market penetration. Jointly, these two providers have 73.0% of business internet coverage in El Paso County.

Economic Impact Study Key Findings

The economic impact study considers the economic impacts of broadband expansion over the 17-year period between 2022-2040. The total effect of the expansion project on output for El Paso is \$73,709,661. Given that the total cost of the project is assumed to be \$36,360,000, this represents a two-fold increase.²

Recommendations

Using the data from these findings, the Hunt Institute recommends that the county focus its broadband expansion efforts on the following:

1. The FCC estimates 99.5% of El Paso County's urban population meets the minimum broadband standards, compared to only 53.8% of the county's rural population. Considering FCC estimates and given the county population distribution between urban (96.5%) and rural (3.5%) residents, El Paso County would have a 96.8% share of the total population with broadband access. This is in stark contrast to the household survey respondents' much lower share of 56.7% with broadband services. By overstating the current level of broadband connectivity in El Paso, the FCC maps may jeopardize the county's ability to attract federal funds that have been allocated to expanding broadband infrastructure throughout the country.³
2. The eastern regions of El Paso County, which includes the East and Lower Valley regions, are currently underserved in terms of residential and business broadband access. Future expansion programs should consider these areas of high need.
3. The Lower Valley region recorded the lowest median download speed. Focusing on the bottom quintile of households in terms of download and upload speeds, the Lower Valley region stood out with the lowest average scores among all regions considered. Therefore, the Lower Valley region is an underserved area to focus efforts to increase accessible and reliable broadband internet speed in El Paso County.
4. Gaps in perceived service quality were observed for businesses who use a provider other than AT&T and Spectrum. Future expansion programs should consider targeting areas where these providers are less present.
5. Survey results point to gaps in digital literacy across the various regions in El Paso County. Households from the Lower Valley region (17.5%) and the Central region (15.8%) had the largest shares of heads of household who

² This estimate is best interpreted as a lower bound of the total impact of the expansion project.

³ Urban and rural shares for El Paso County as per the U.S. Census Bureau, 2010.

were non-proficient with Microsoft Office and internet browsing. These regions also held the largest shares of non-proficiency with respect to online communication platforms. Policymakers should consider programs to raise digital literacy in these areas as a complement to potential broadband expansion programs.

6. Internet connection disruptions were mainly attributed to internet provider issues by households (56.1%) and businesses (62.5%) followed by connection issues due to the close proximity to the U.S.-Mexico border, with 13.7% and 17.0%, respectively. Therefore, when designing policies that improve services offered in El Paso County, officials must also consider how the county's specific geographic location impacts service quality.

Introduction

In November 2021, President Joe Biden signed into law the Infrastructure Investment and Jobs Act, which added \$65 billion to existing appropriations to achieve the goal of universal broadband access and affordability. The bulk of this appropriation—\$42.5 billion—is to fund broadband deployment efforts. This funding creates an opportunity for the County of El Paso to identify and address broadband access gaps within its jurisdiction. Expanded access to high quality, reliable broadband connections increases economic growth, improves educational outcomes, and augments access to telehealth.

The County of El Paso partnered with the El Paso Community Foundation (EPCF) and commissioned two research centers at the University of Texas at El Paso (UTEP)—the Hunt Institute for Global Competitiveness and the Mike Loya Center for Innovation and Commerce—to examine the current condition of broadband access and infrastructure in El Paso and present options for converting that network into cutting-edge technology that is widely accessible by all county residents. The resulting research agreement titled “Broadband Limitations during COVID-19 Pandemic and Impact of Expanding Broadband Services in El Paso County” has spanned multiple reports produced by the various partners.

The present report, which concludes the research agreement, assesses the current state of broadband access and infrastructure in El Paso County, determines current market conditions and willingness to pay for new services, and provides an economic impact study for a proposed broadband expansion program. To achieve these objectives, the Hunt Institute created and distributed surveys to households and businesses to collect data on current broadband access and availability, determine market share, and assess demand for expanded services that may be provided by the county. Finally, the report presents an economic impact study on broadband expansion in El Paso County from 2022 to 2040. The proposed expansion and costs estimates developed in the complementary report from the Loya Center—“Broadband Expansion Business Plan: Fiber-to-the-Premises Plan for El Paso, TX”—are used as inputs in the economic impact study.

The Federal Communications Commission (FCC) publishes maps of broadband connectivity at the census tract level using data from internet service providers on the reach and scope of their networks. In practice, the FCC’s maps overstate El Paso’s level of connectivity. The FCC’s “2019 Broadband Deployment Report” currently ranks El Paso County as one of the more connected counties in the state. The FCC estimates 99.5% of El Paso County’s urban population meets the minimum broadband standards, compared to only 53.8% of the county’s rural population. Considering FCC estimates and given the county population distribution between urban (96.5%) and rural (3.5%) residents, El Paso County would have a 96.8% share of the total

population with broadband access. This is in stark contrast to the household survey respondents' much lower share of 56.7% with broadband services. By overstating the current level of broadband connectivity in El Paso, the FCC maps may jeopardize the county's ability to attract federal funds that have been allocated to expanding broadband infrastructure throughout the country.

El Paso has unique geopolitical boundaries that limit the reliability of the FCC's maps in the county. The county's southern edge is the U.S.-Mexico border. Internet and cellular customers report service interruptions in proximity to the border. The Franklin Mountain Range that bisects the county and the large low-density areas on the county's eastern edge further complicate the deployment of internet infrastructure. To address these limitations and provide policymakers with an accurate understanding of the capabilities of El Paso's internet infrastructure, the Hunt Institute undertook a survey of both residents and businesses in the county. The Institute distributed these surveys in physical form to a random sampling of residential and business addresses in the county. The Institute also distributed electronic versions of the survey through the electronic mailing lists of various organizations and through social media. The Hunt Institute supplemented this data gathering by conducting focus groups with residential and business internet users.

These surveys and focus groups provided detailed information on current usage and market demand from actual broadband customers. The survey tools also gave residential and business customers an opportunity to provide feedback about the limitations of existing broadband infrastructure, state their own needs and limitations, and voice their expectations for a potential infrastructure buildout. Data from the household and business surveys also provide information on access options, available speeds, and network quality by region. The Hunt Institute mapped this information into five regions within the county for residential customers and into a single region for commercial customers.

The report also presents an economic impact study for a proposed broadband expansion plan. As described above, the economic impact study builds on a complementary report produced by the Loya Center regarding a broadband expansion business plan. This information is needed by the county as it evaluates the costs presented in the Loya Center's business plan. The economic impact study models growth in jobs and income that would result from broadband expansion, with an emphasis on the top ten industries that would benefit from the expansion. The impact study also examines other economic outputs that would be affected by the network changes.

In summary, the report takes stock of the current state of broadband coverage and infrastructure in El Paso County, assesses current market conditions and attitudes toward broadband expansion, and provides an economic impact analysis of the likely consequences of a proposed expansion project. Access to a dependable broadband connection is essential for personal and professional communication, including telework, online education, and telehealth services. Counties that lack sufficient

broadband infrastructure risk outward migration, especially from the younger population who might require broadband access for telework or remote education. These counties may also face difficulty attracting new businesses and residents who are internet dependent (Strategic Networks Group, 2018). The COVID-19 pandemic amplified the need for communities to stay connected, while increasing the demand for reliable, low-cost, high-speed internet access. By creating a network like this, the County of El Paso will foster a more diverse, stable, and resilient economy.

Key Findings

This section summarizes the keys findings of both the residential and business surveys. Detailed analysis of these results appears in the following section.

Residential Survey Results

Broadband Access

- Of the total household survey respondents, 82.7% reported having access to the internet, while 17.3% reported not having internet in their homes.
- Of all households without internet, roughly 60% were from the eastern regions of El Paso County, with 36.6% from the East region and 20.7% from the Lower Valley region. A fourth (25.6%) came from the Central region, 12.2% from the Far West region, and 4.9% from the West region.

Broadband Speeds

- Of the households that reported having internet, 31.5% reported download and upload speeds that did not meet the Federal Communication Commission's (FCC) minimum requirements for broadband.⁴ Therefore, 56.7% of household survey respondents have broadband services in El Paso. This figure is in stark contrast to the 96.8% figure that would have broadband access as reported by the FCC. 18.2% of the respondents reported paying for an advertised download speed of more than 300 megabits per second (Mbps).
- 35.9% of the respondents were unaware of the advertised download speed for which they were paying.
- The actual median download speed was within the advertised range for all categories except the more than 300 Mbps range, which had a median download speed of 273.9 Mbps.

⁴ Respondents reported their download and upload speeds by logging into a speed test website and testing their internet connection.

- The Lower Valley region recorded the lowest median download speed, as well as the lowest speeds for the average download and upload speeds bottom quintiles for households. Therefore, the Lower Valley region is an underserved area to focus efforts to increase accessible and reliable broadband internet speed in El Paso County.

Main Internet Providers

- With respect to internet providers for home computers, laptops, tablets, and TVs, there were two main providers, which account for a market share of nearly 90%: Spectrum (58.6%) and AT&T (29.4%).

Main Internet Providers (Mobile Phones)

- In contrast to computers, laptops, tablets, and TVs, there were four main internet providers for mobile phones. Spectrum (28.0%) was the largest provider of internet for mobile phones, followed by AT&T (22.1%), Verizon (19.5%), and T-Mobile (19.0%).

Quality of Internet Services

- Across all providers, 20.1% of all households rated their internet connection as excellent, 42.1% rated their connection as good, 29.1% rated it as average, and 8.7% reported a poor home internet connection.
- For households that use Spectrum, 19.1% rated their connection as excellent, 41.2% rated it as good, 30.4% rated it as average, and 9.3% reported a poor connection.
- For households that use AT&T, 18.5% rated it as excellent, 43.1% rated it as good, 30.8% rated it as average, and 7.7% reported a poor connection.
- Of those respondents using other providers, 40.0% rate their internet connection as good, 29.1% rate their service as average, 20% as excellent, and 10.9% as poor.

Internet Outages

- 56.1% of respondents attributed their internet connection disruptions to internet provider issues, while 13.7% attributed their connection issues to living close to the U.S.-Mexico border.
- 45.8% of respondents reported experiencing outages fewer than three times a week, while 42.0% do not experience internet outages in a given week.
- 37.6% of respondents reported experiencing internet outages that lasted less than 30 minutes per day due to slow or inoperable internet speeds.
- 25.5% of respondents reported internet outages of more than 30 minutes per day or intermittent outages with slow speeds at any given time of day.
- 36.9% of respondents reported experiencing no outages.

Internet Usage

- The most frequent tasks performed online by households are email (79.9%), and banking or bill paying (73.6%). Notably, roughly 80% of respondents used the internet for telework or video conferencing (41.6%) or online education (40.3%).
- There was a large shift from households having no residents working remotely to having one or two residents per household working remotely in September 2020 compared to September 2019. In September 2019, 60.0% of the respondents reported having no residents working remotely, while in September 2020, only 35.8% reported having no residents working from home.
- The number of households with residents taking online classes also increased noticeably in 2020. 52.8% of the respondents had no residents taking online classes in September 2019, but in September 2020 that dropped to 35.9%.
- Cable was the most common type of internet service reported with 43.8% of households reporting a cable connection.
- The next most common type of internet service was a fiber-optic connection with 19.1% of households reporting a fiber-optic connection.
- About 14.6% reported not knowing what internet service they used.

Internet Cost

- More than half of the respondents reported paying between \$40.00 and \$79.99 per month, with 21.8% paying between \$40.00 and \$59.99, and 30.2% paying between \$60.00 and \$79.99 per month. 3.3% reported not knowing what they paid per month.

Digital Literacy

- Households from the Lower Valley region (17.5%) and the Central region (15.8%) had the largest shares of heads of household who were non-proficient with Microsoft Office and internet browsing.
- Households from the Lower Valley region (25.9%) and the Central region (22.1%) had the largest shares of non-proficiency with respect to online communication platforms.

Household Approval of El Paso County Offering Broadband Services

- 55.8% of the respondents reported approving of El Paso County, or one of its partners, offering internet services, even if they compete with private sector companies, while 14.8% disapproved of such a proposal. 14.8% said they do not know and 11.1% were neutral.

Income

- 33.0% of households in El Paso County reported income of \$40,000 or less.
- The Lower Valley (55.7%), Central (54.6%), and East (33.9%) regions had the largest shares of respondents with annual gross income of \$40,000 or less.

Education

- 29.9% of the heads of household reported a graduate degree as the highest level of education attained and 28.4% reported a bachelor's degree. Some college and high school diploma or GED were the next highest levels of educational attainment at 16.9% and 12.3%, respectively.

Respondent Ethnicity and Sex

- 60.0% of the respondents identified as Hispanic or Latino, while 10.1% preferred not to answer.
- 61.2% of heads-of-households identified as male, while 31.9% identified as female.

Business Survey Results

Business Survey Participants by Industry Sector

- Business survey participants in the trade, transportation, and utilities (18.8%), retail trade (17.2%), manufacturing (9.4%), and wholesale trade (7.8%) sectors accounted for more than half of the business participants (53.2%).

Broadband Access

- 90% of survey respondents reported having access to the internet, 8.2% reported not having internet service for their business.

Broadband Speeds

- Of the businesses survey participants that reported having internet, 19.8% reported download and upload speeds that did not meet the Federal Communication Commission's (FCC) minimum requirements for broadband.⁵
- Across sectors, the education and health services sector, and the professional and business services sector held the largest share of businesses that reported download and upload speeds that did not meet the FCC's minimum broadband requirements for broadband with 26.7% and 20.0%, respectively.
- 18.5% of businesses reported paying for an advertised download speed between 101 Mbps and 200 Mbps, while 39.5% of the respondents were unaware of the advertised download speed for which they were paying.

⁵ Respondents reported their download and upload speeds by logging into a speed test website and testing their internet connection.

Main Internet Providers

- With a 46.0% market share, Spectrum was reported as the main internet provider for most business computers, laptops, tablets, and TVs. AT&T followed with 27.0% market share. Jointly, these two providers have 73.0% of business internet coverage in El Paso County.
- The majority of businesses have Spectrum as a main provider (leisure and hospitality, manufacturing, professional and business services sectors, and financial activities) except for those using AT&T, which are the education and health services sector (41.7%) and the trade, transportation, utilities sector (75.0%).

Main Internet Providers (Mobile Phones)

- AT&T was the main internet provider when using mobile phones, with 30.5% of respondents. Spectrum (28.0%) and Verizon (22.0%) were also major mobile providers, while all other providers accounted for 19.5%.

Quality of Internet Services

- Across all providers, business users rated their internet connections as follows: 18.3% excellent; 38.3% good; 30.4% average; and 13.0% poor.
- Users with AT&T rated their connection as follows: 22.2% excellent; 44.4% good; 33.3% average; and 0% poor.
- Users with Spectrum rated their connection as follows: 26.3% excellent; 21.1% good; 42.1% average; and 10.5% poor.
- Users with all other providers rated their connection as: 6.7% excellent; 33.3% good; 20% average; and 40% poor.

Internet Outages

- 62.5% of businesses attributed their internet connection disruptions to internet provider issues, and 17% attributed their connection issues to proximity to the U.S.-Mexico border.
- 43.5% of businesses reported internet outages that lasted less than 30 minutes per day due to slow or inoperable internet speeds, while 13.9% reported internet outages that were intermittent, with slow speed at any given time of the day.

Internet Usage

- Internet usage increased from September 2019 to September 2020 for the following business activities: research and analysis (from 43.1% to 43.8%), marketing and advertising (from 30.6% to 31.9%), e-commerce (from 29.9% to 31.9%), and point-of-sale terminal (from 23.6% to 24.3%).
- Cable and fiber-optic were the two most common type of internet services, with 43.4% and 21.2% of businesses, respectively.
- Fixed wireless and DSL used by 8.8% of businesses, while cell phones or cellular hotspots were used by 4.4%.
- 11.5% of businesses reported not knowing what internet service they used.

Internet Cost

- Cost breakdown across all providers was as follows: 29.3% between \$50.00 and \$99.99 per month; 35.3% between \$100.00 and \$199.99 per month; 10.3% between \$200.00 and \$299.99 per month; and 7.8% more than \$400 per month.
- 5.2% reported not knowing what they paid per month.

Customer Service Quality Evaluation

- 45.4% of businesses reported approving of El Paso County, or one of its partners, offering broadband internet services, while 26.9% disapproved. 11.8% were neutral and 16.0% said they did not know how they viewed such a policy.
- Nearly half of businesses reported that they would likely (28.1%) or very likely (21.1%) use internet services provided by El Paso County. Over a quarter (28.1%) were neutral, while 14.0% were very unlikely and 8.8% were unlikely.

Digital Literacy

- About 2.5% of businesses reported non-proficient use with Microsoft Office and 2.5% also reported non-proficiency in employee skill level for online platforms. Also, 13.3% reported their employees had a basic skill level with Microsoft office and 21.8% reported a basic skill level for online platforms.

Respondent Ethnicity and Sex

- 46.2% of businesses were identified as Hispanic or Latino-owned.
- 26.9% of businesses were identified as woman-owned.
- 10.1% of businesses were identified as veteran-owned.

Internet Consumer Surveys and Broadband Access Maps

Methodology

The Hunt Institute designed household and business surveys to assess the market penetration and market demand for internet broadband services as well as the needs and limitations for these services across El Paso County. The Institute distributed the survey by U.S. Mail and promoted it via email and social media on Facebook and Twitter.

Two data sources were used to establish the number of households and businesses by zip code in El Paso County. This first set came from the U.S. Census Bureau and the second from an owned database of addresses for households and businesses. In instances where the number addresses were lower than that of the U.S. Census Bureau, the team georeferenced additional addresses to close the gaps. All database addresses were geocoded and verified prior to their use in the power analysis.

Based on past experience with similar surveys in the region, a 10% response rate was expected for the residential and business surveys, so a corresponding upward sample size adjustment, bounded to the maximum number of addresses by zip code, was made. Given this calculation, the Institute printed and mailed 31,650 household surveys and 14,501 business surveys in El Paso County, with both English and Spanish versions included. The paper surveys allowed households and businesses who lack access to the internet to participate in the survey. However, survey recipients were also provided with a hyperlink to complete the survey electronically.

The objective of the residential survey was to identify:

- Characteristics of respondents, for example zip code, home type (e.g., owned vs. rented), income level, and number of residents using internet in the home.
- The degree of digital literacy in El Paso County and how digital literacy varies across regions.
- Cost and service level of current internet services.
- Main internet providers by region.

- Sentiment towards current internet service.
- Identification of unmet demand.
- Sentiment towards county involvement in internet marketplace.
- Profile of underserved respondents and regions by internet usage.

The objective of the business survey was to identify:

- Characteristics of respondents such as zip code, sector, number of employees, and annual revenue.
- The degree of digital literacy among business owners and employees in El Paso County and determine how digital literacy varies across regions.
- Cost and service level of current internet services.
- Main internet providers by region.
- Sentiment towards the quality, performance, and pricing of services currently being paid for, but also identifying unmatched demand due to pricing or lack of available services being offered.
- Identification of unmet demand.
- Sentiment towards county involvement in internet marketplace.
- Profile of underserved businesses and regions by internet usage.

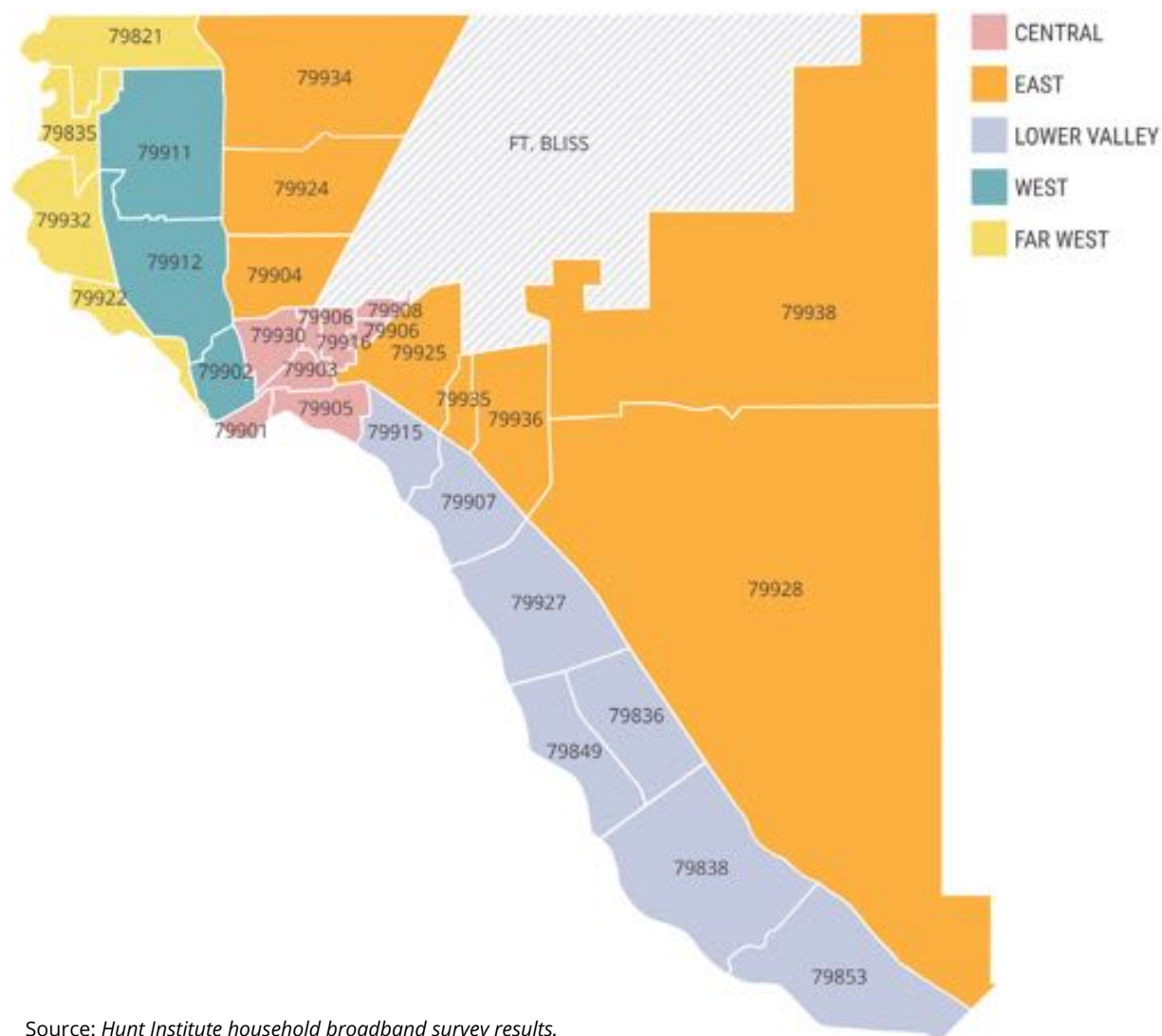
Survey recipients, for both businesses and residences, were given the option to complete the survey either physically by return mail or by electronically over an internet connection. The survey instructed respondents to fill out the English version or the Spanish version, and for those surveys in paper, to return, a self-addressed, stamped envelope provided with the survey. However, the recipients who chose to take the survey online received an access code and were instructed not to return a paper copy.

As of December 14, 2021, 630 household responses and 144 business responses were received. Given that responses received are not representative by zip code, household responses were aggregated to five regions (Map 1) for which a representative sample size was obtained at the +/- 10% margin of error with a 90% significance level.

Map 1 shows the distribution of all zip codes in El Paso County that were considered

for the analysis. The Hunt Institute assigned each zip code to a group region based on location. The zip codes were given a unique color according to their group region, as displayed in Map 1.

Map 1: El Paso County Broadband Regions by Zip Code



Source: Hunt Institute household broadband survey results.

Table 1 displays the household sample size and the obtained responses by region. Column (A) provides the number of households as per the U.S. Census Bureau while column (B) the geocoded households. The table also displays the share that the geocoded addresses represent from the data shared by the U.S. Census Bureau. The last two columns represent the estimated sample size by region, which is 68 responses, and the actual household responses obtained by December 14, 2021, which is 630.

Table 1: Households Sample Size and Responses by Region

REGION	NUMBER OF HOUSEHOLDS (A)	GEOCODED HOUSEHOLDS (B)	SHARE (B/A)	ESTIMATED SAMPLE SIZE	HOUSEHOLD RESPONSES
CENTRAL	34,762	32,337	93%	68	94
EAST	147,269	156,013	106%	68	204
LOWER VALLEY	51,978	50,466	97%	68	98
WEST	43,751	44,914	103%	68	116
FAR WEST	18,514	18,386	99%	68	118
EL PASO COUNTY	296,274	302,116	102%	68	630

Note: Number of households as per the U.S. Census Bureau, 2019. The cut-off date for household responses is December 14, 2021.
Source: Hunt Institute broadband survey results.

The estimated sample size and responses by businesses in El Paso County is in Table 2. Because the total number of business responses was not significant at the zip code level or at the region level, business results are provided at the county level. In Table 2, column (A) is the number of businesses as per the U.S. Census Bureau, column (B) is the geocoded businesses. The table includes a column providing the share that the geocoded addresses represent from the U.S. Census Bureau data. The last two columns represent the estimated business sample size by region, which is 67 responses, and the actual responses obtained by December 14, 2021, which is 144.

Table 2: Businesses Sample Size and Responses by Region

REGION	NUMBER OF BUSINESSES (A)	GEOCODED BUSINESSES (B)	SHARE (B/A)	ESTIMATED SAMPLE SIZE	HOUSEHOLD RESPONSES
EL PASO	14,712	21,358	145%	67	144

Note: Number of households as per the U.S. Census Bureau, 2019. The cut-off date for household responses is December 14, 2021.
Source: Hunt Institute broadband survey results.

Findings from Residential Surveys

Broadband Access

The largest share of household survey responses was received from the West region (33.2%) of El Paso County. The Far West region (25.8%) accounted for the next largest share of responses, followed by the East (21.7%), Central (13.8%), and Lower Valley (12.4%) regions. Household responses for each region are representative.

Figure 1: Household Responses by Region, El Paso County (%)



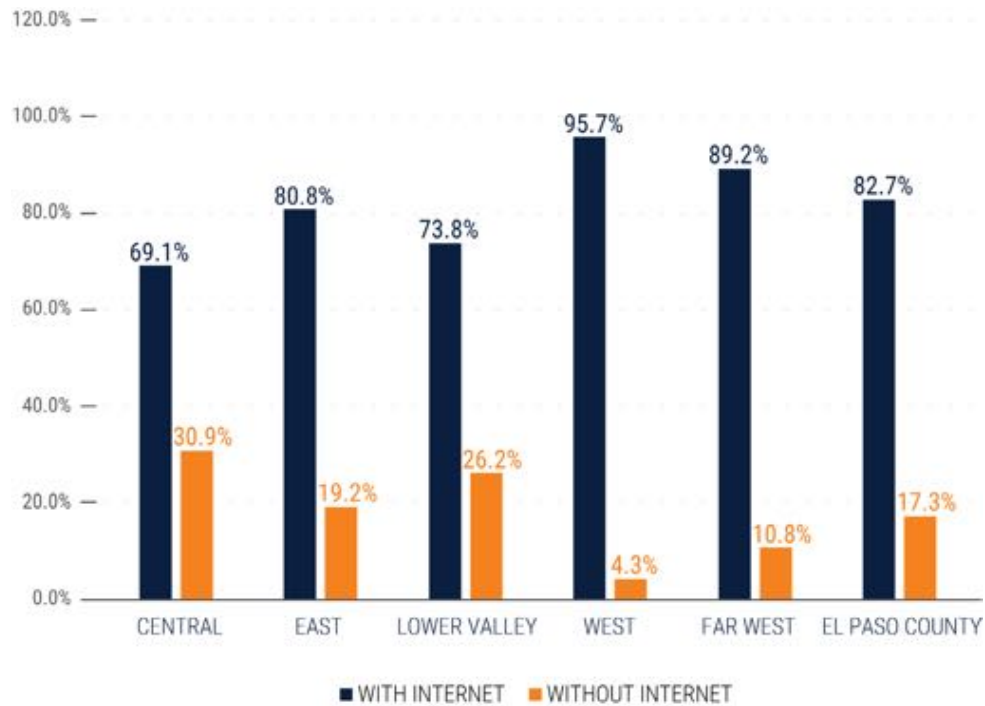
Note: See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Figure 2 shows that 17.3% of all household survey respondents reported not having internet in their homes.

Within the individual regions, 30.9% of survey respondents from the Central region lacked internet. The Lower Valley region yielded 26.2% of respondents who did not have internet; about a fifth (19.2%) of households from the East region did not have internet.

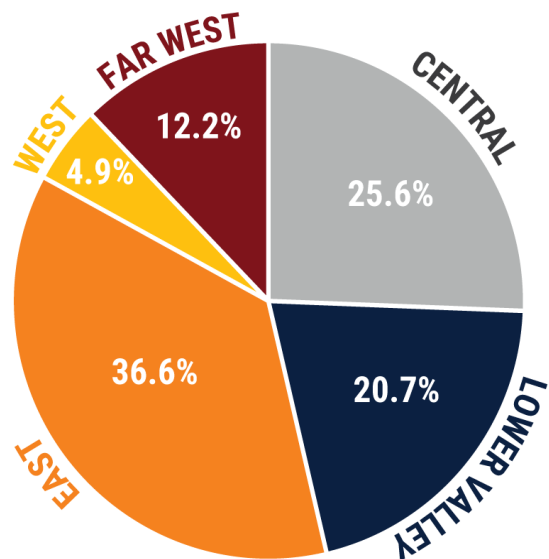
Figure 2: Households with and without Internet by Region (%)



Source: Hunt Institute broadband survey results.

Of all households without internet, roughly 60% were from the two eastern regions of El Paso County, with 36.6% from the East region and 20.7% from the Lower Valley region. The remainder of households without internet were distributed as follows: 25.6% from the Central region, 12.2% from the Far West region, and 4.9% from the West region.

Figure 3: Households without Internet by Region (%)



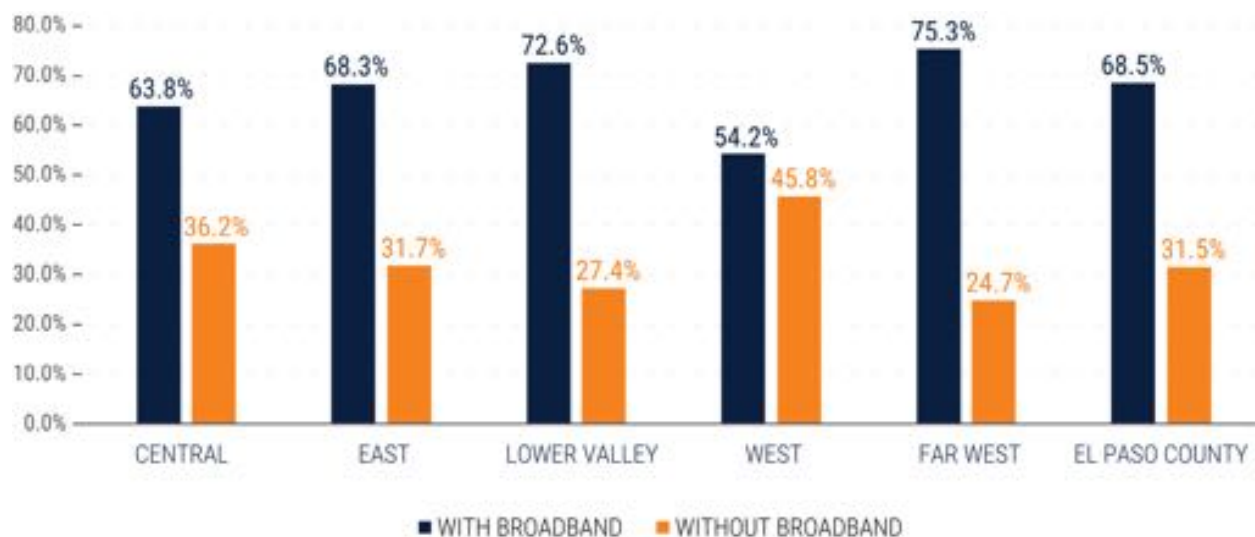
Source: Hunt Institute broadband survey results.

Broadband Speeds

Of the 82.7% of households that reported having internet, 31.5% reported download and upload speeds that did not meet the FCC's minimum requirements for broadband of 25 Mbps for download speed and 3 Mbps for upload speed. Survey respondents were provided a link to a website that tests their internet connection speed and they were asked to provide the test results. The regions with the largest share of respondents that did not meet minimum broadband requirements were the West region (45.8%), the Central region (36.2%), and the East region (31.7%).

The FCC estimates 97.5% of El Paso County's urban population meets the minimum broadband standards, compared to only 53.8% of the County's rural population. Considering FCC estimates and given the County population distribution between urban (96.5%) and rural (3.5%) residents, El Paso County would have a 96.8% share of the total population with broadband access.⁶ This is in stark contrast to the household survey respondents' much lower share of 56.7% with broadband services. By overstating the current level of broadband connectivity in El Paso, the FCC maps may jeopardize the county's ability to attract federal funds that have been allocated to expanding broadband infrastructure throughout the country.

Figure 4: Households with Internet that Meet Minimum Broadband Standards (%)



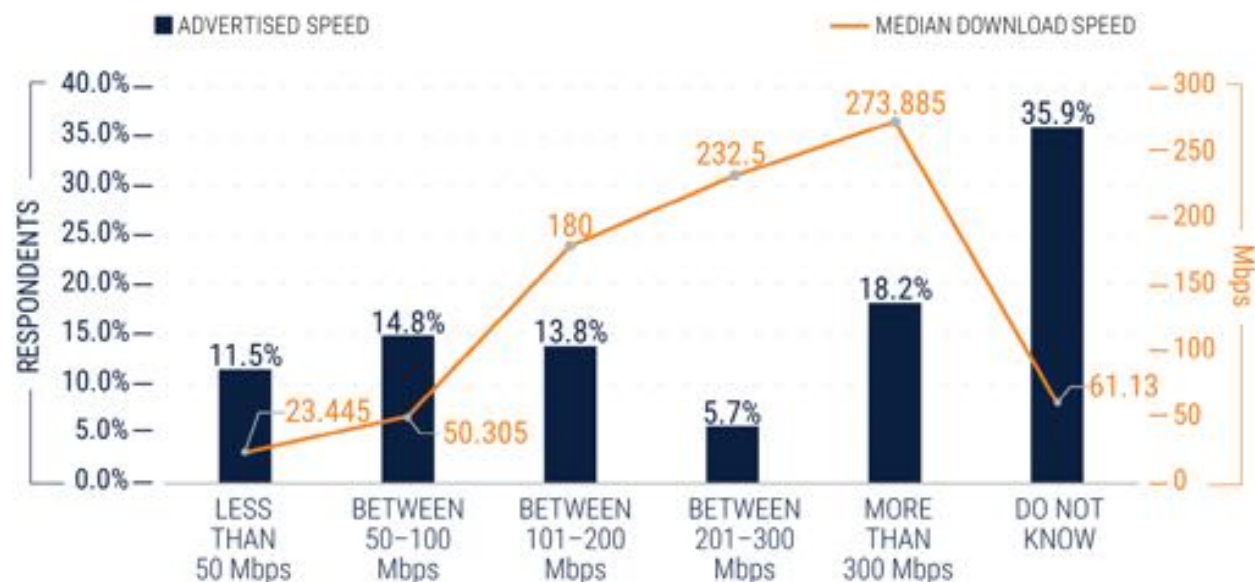
Note: The Hunt Institute uses the FCC definition of broadband as 25 Mbps for download speed and 3 Mbps for upload speed. Respondents who have internet but did not match or exceed FCC download and upload speeds were listed as not having broadband. Respondents reported their download and upload speeds by logging into a speed test website and testing their internet connection.

Source: Hunt Institute broadband survey results.

⁶ Urban and rural shares for El Paso County as per the U.S. Census Bureau, 2010.

In terms of download speeds, 18.2% of survey respondents reported paying for an advertised download speed of more than 300 Mbps, while 14.8% and 13.8% reported paying for 50 Mbps to 100 Mbps and 101 Mbps to 200 Mbps, respectively. A significant proportion of respondents (35.9%) were unaware of the advertised download speed for which they were paying. The actual median download speed was within the advertised range for all categories except the more than 300 Mbps range, which had a median download speed of 273.9 Mbps.

Figure 5: Download Speed by Advertised Range (%) vs. Median Download Speed by Range (Mbps)



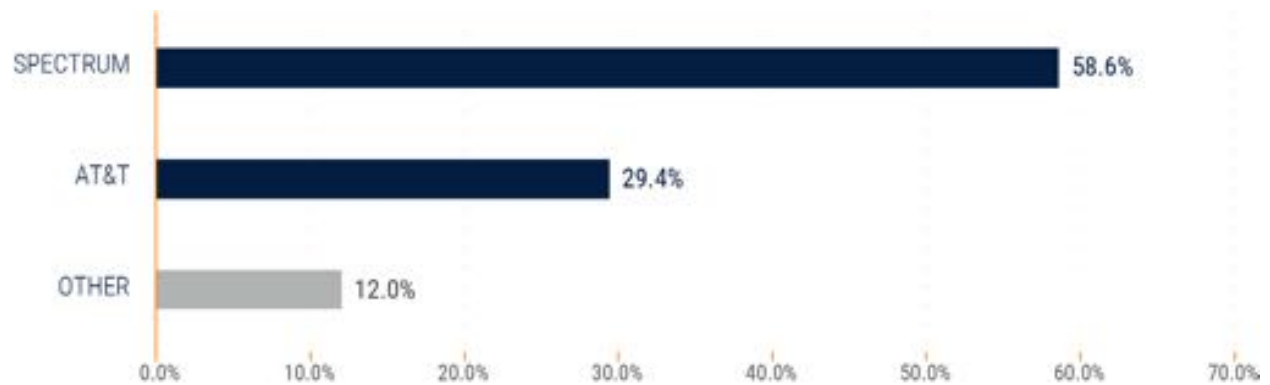
Note: Percentages represent the shares of households by the advertised download speed range they are billed for. Median download speeds correspond to the actual download speeds in Mbps reported by the households from each range. Respondents reported their download and upload speeds by logging into a speed test website and testing their internet connection.

Source: Hunt Institute broadband survey results.

Main Internet Providers

There are two main internet providers who service households in El Paso County, Spectrum and AT&T. Nearly 90% of respondents use either Spectrum (58.6%) or AT&T (29.4%) as their main internet provider, while other providers account for the remaining 12.0% of residential customers for.

Figure 6: Main Internet Provider for Home Computers, Laptops, Tablets, and TVs (%)



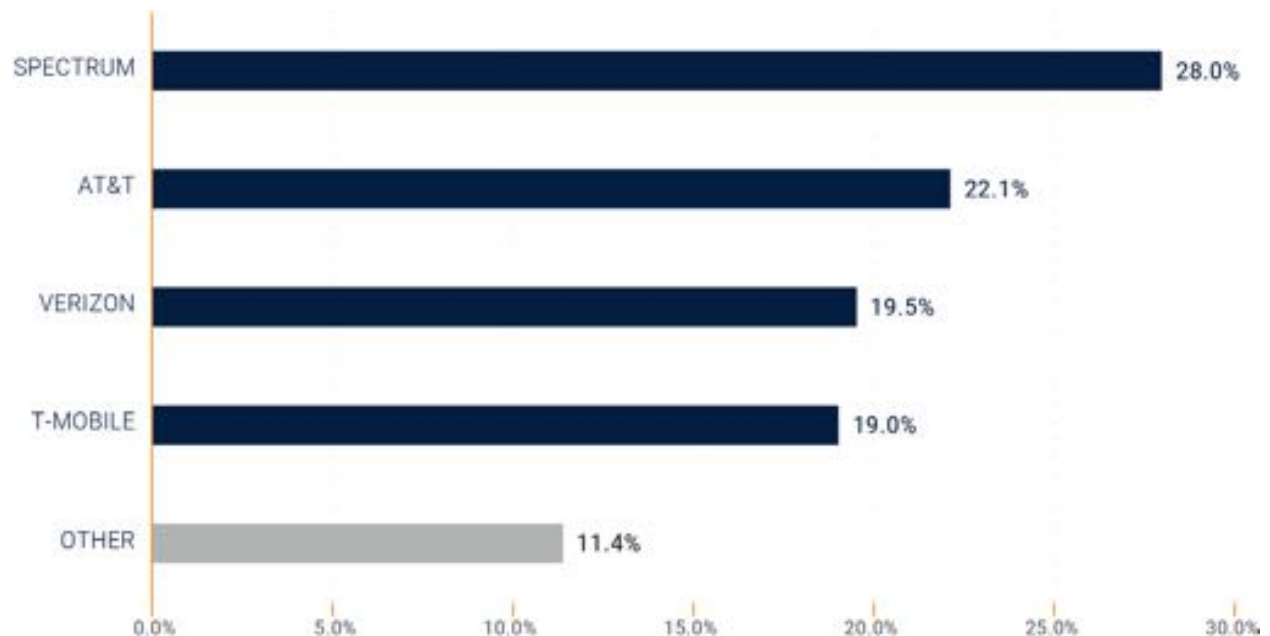
Note: Other includes HughesNet, JackRabbit, Metro by T-Mobile, Sprint, T-Mobile, Verizon, Viasat, Vivint, West Central Net, and others not denoted.

Source: Hunt Institute broadband survey results.

Main Internet Providers (Mobile Phones)

There are four main mobile internet providers in the county. Spectrum remained the largest provider for this category (28.0%), followed by AT&T (22.1%), Verizon (19.5%), and T-Mobile (19.0%). All other providers accounted for 11.4%.

Figure 7: Main Internet Provider for Mobile Phones (%)



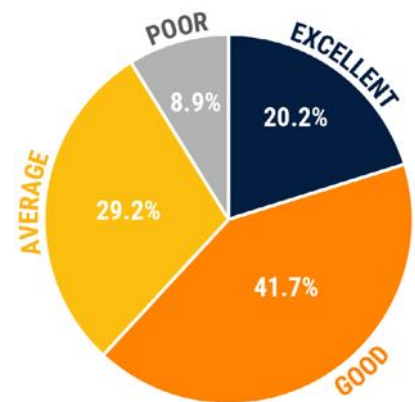
Note: Other includes Boost Mobile, HughesNet, Metro by T-Mobile, Sprint, Viasat, Vivint, West Central Net, and others not denoted.

Source: Hunt Institute broadband survey results.

Quality of Internet Services

In terms of connection quality, 20.2% of the respondents rated their internet connection as excellent, 41.7% rated their connection as good, 29.2% rated it as average, and 8.9% reported a poor home internet connection.

Figure 8: Quality of Home Internet Connection (%)



Note: Results are based on the opinions of the respondents.
Source: Hunt Institute broadband survey results.

Focusing on respondents who use Spectrum for their internet, 19.1% rate their connection as excellent, 41.2% rate it as good, 30.4% rate it as average, and 9.3% rated it as poor. For AT&T users, 18.5% rate their connection as excellent, 43.1% rate it as good, 30.8% rated it as average, and 7.7% rated it as poor. Of those respondents using other providers, 10.9% rated their service as poor.

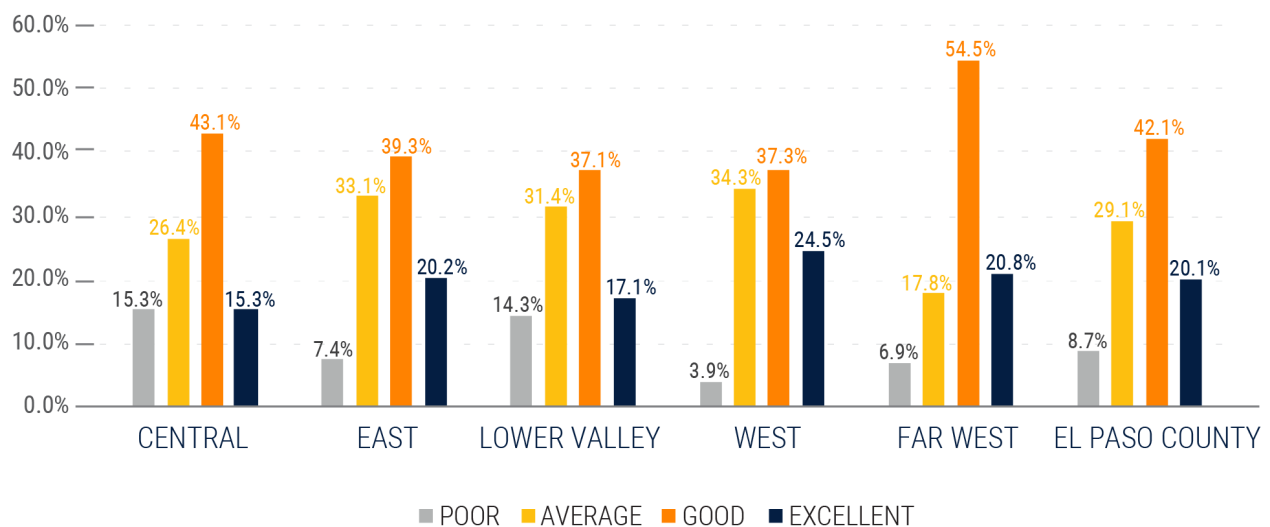
Table 3: Quality of Home Internet Connection by Provider (%)

QUALITY	SPECTRUM	AT&T	OTHER
EXCELLENT	19.1%	18.5%	20.0%
GOOD	41.2%	43.1%	40.0%
AVERAGE	30.4%	30.8%	29.1%
POOR	9.3%	7.7%	10.9%
GRAND TOTAL	100.0%	100.0%	100.0%

Note: Results are based on the opinions of the respondents. Other includes Sprint, T-Mobile, Verizon, Viasat, West Central Net, Vivint, JackRabbit, HughesNet, and others not denoted.
Source: Hunt Institute broadband survey results.

Variation in reported connection quality across regions was also observed. Respondents in the Far West region had the most positive view of their services, with 75.3% rating their service as either excellent (20.8%) or good (54.5%). This is in stark contrast to the county average where 62.2% of respondents rated their service as either excellent (20.1%) or good (42.1%). Respondents from the Lower Valley region had the least favorable view of their services with 45.7% rating their services as either average (31.4%) or poor (14.3%). Additional details on reported connection quality by region can be found in Figure 9.

Figure 9: Quality of Home Internet Connection by Region (%)

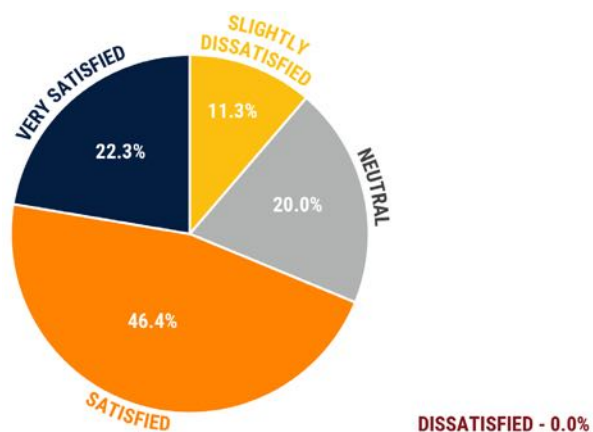


Note: Results are based on the opinions of the respondents.

Source: Hunt Institute broadband survey results.

In terms of consumer satisfaction, 22.3% of respondents were very satisfied with their home internet connection, 46.4% were satisfied, 20.0% were neutral, and 11.3% were slightly dissatisfied.

Figure 10: Level of Satisfaction with Home Internet Service (%)

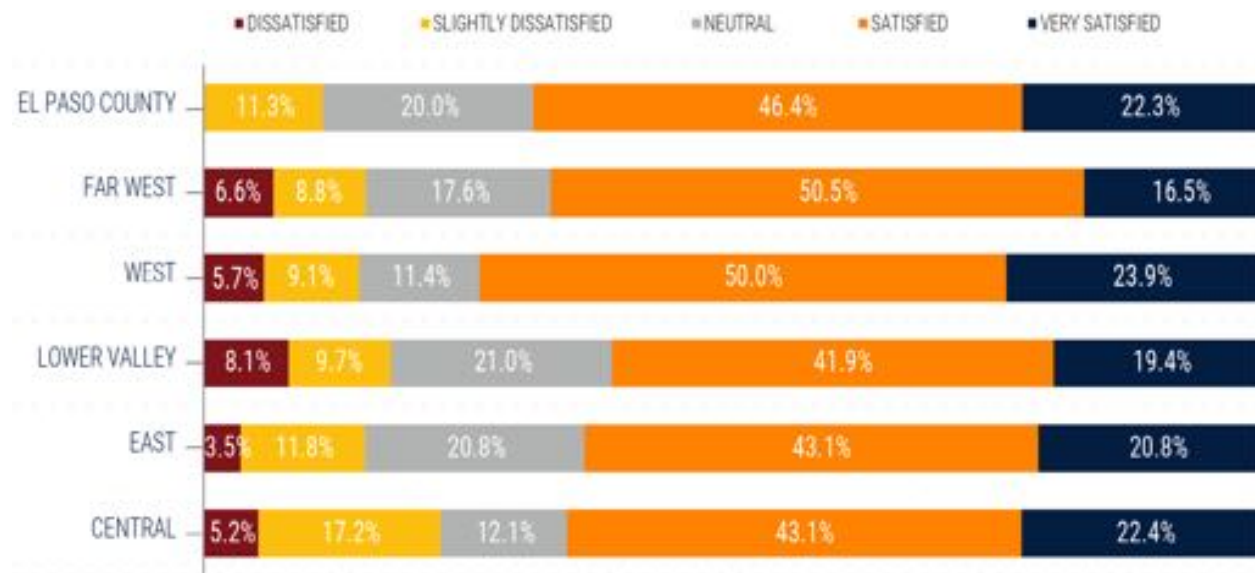


Note: Results are based on the opinions of the respondents.

Source: Hunt Institute broadband survey results.

Half of the respondents from both the Far West region (50.5%) and West region (50.0%) were satisfied with their home internet service. In the Lower Valley region, 41.9% of households reported being satisfied with their home internet service. In the East region, 43.1% of households were satisfied and 11.8% were slightly dissatisfied. In the Central region, 43.1% of respondents reported being satisfied with their home internet service and 17.2% reported being slightly dissatisfied.

Figure 11: Level of Satisfaction with Home Internet Service by Region (%)



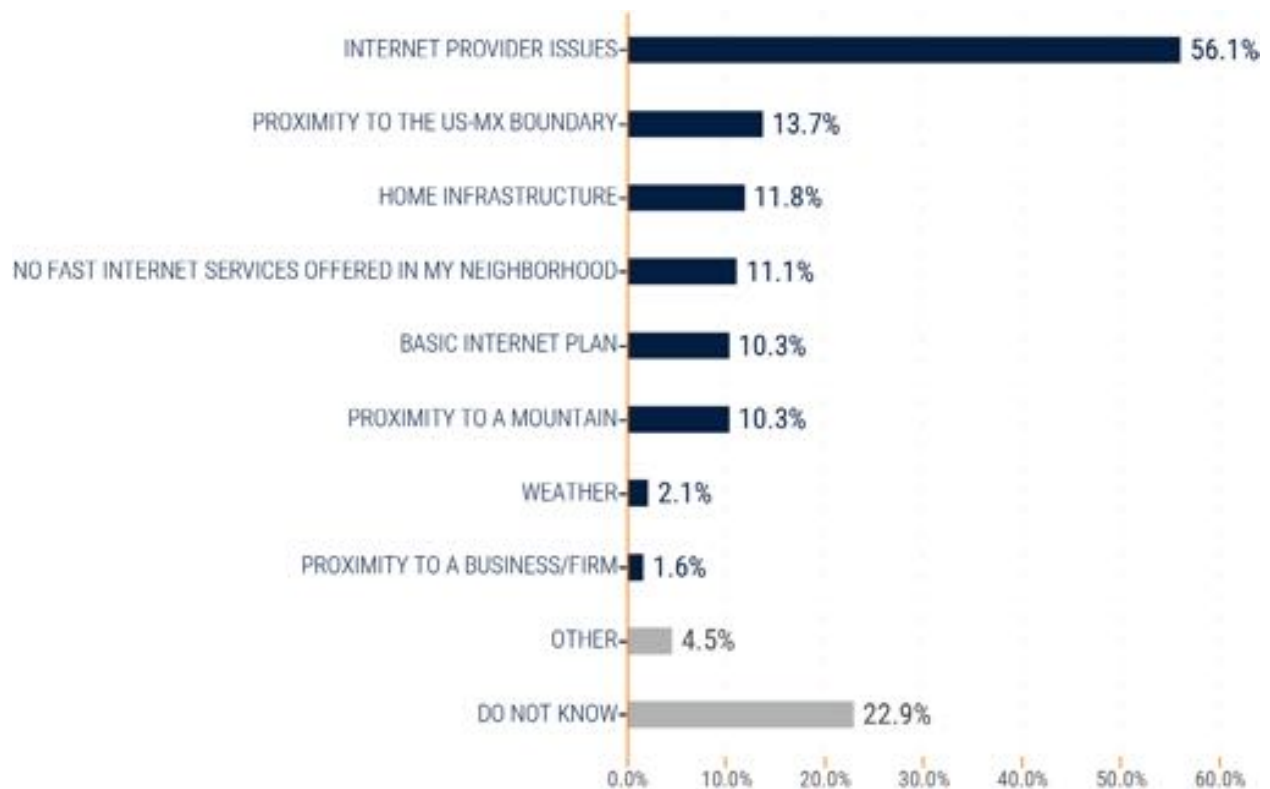
Note: Results are based on the opinions of the respondents. See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Internet Outages

More than half of all households (56.1%) attributed their internet connection disruptions to internet provider issues, while 13.7% attributed their connection issues to living close to the U.S.-Mexico border.

Figure 12: Causes of Internet Connection Interruptions (%)



Note: Results are based on the opinions of the respondents. Respondents were directed to select all that apply, thus, percentages will not sum up to one hundred.

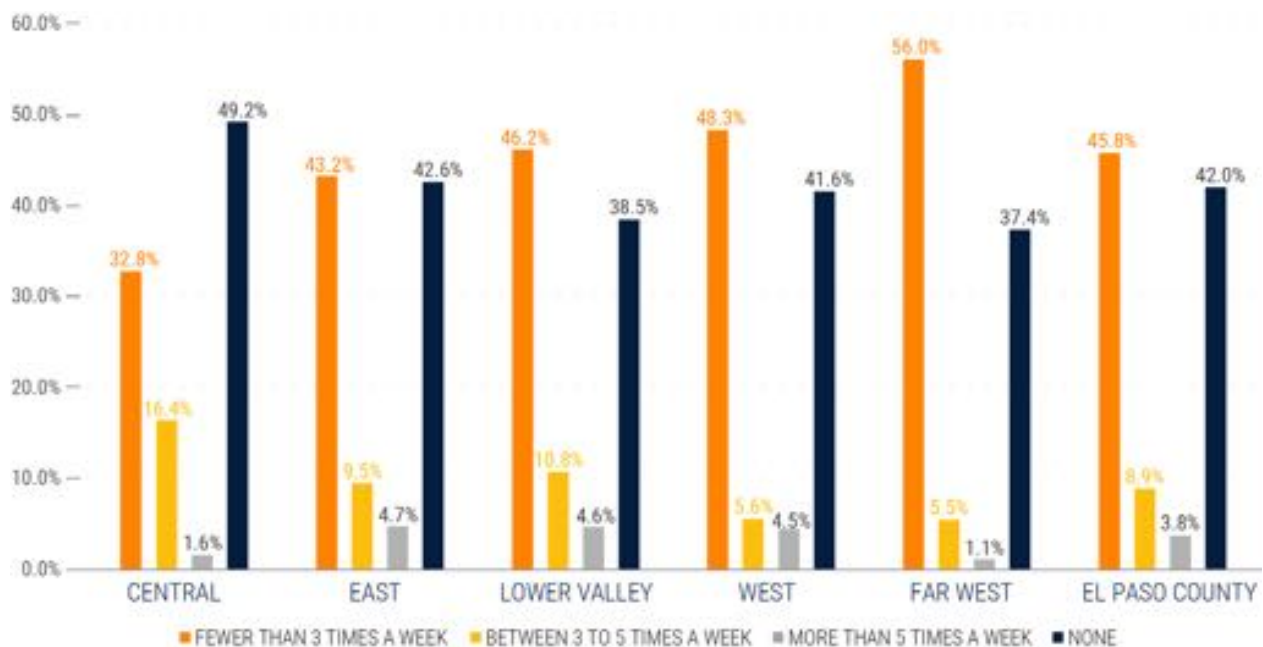
Source: Hunt Institute broadband survey results.

With respect to internet outages, 45.8% of household survey respondents reported experiencing outages fewer than three times a week, while 42.0% do not experience internet outages in a given week. 8.9% of households reported having outages between three to five times a week, while only 3.8% experienced outages more than five times a week.

In four of the five regions, most household survey respondents experience outages fewer than three times a week. The Central region was the outlier, recording the largest share (49.2%) of respondents with no internet outages in a given week, while about 32.8% reported experiencing outages fewer than three times a week. For the East region, 43.2% of households experience

outages fewer than three times a week, while 9.5% experience outages three to five times a week and 4.7% more than five times a week. For the Lower Valley region households, 46.2% reported experiencing outages less than three times a week and 10.8% experience outages three to five times a week. Nearly half (48.3%) of West region household survey respondents reported outages happening fewer than three times a week, and 41.6% reported experiencing none in a given week. The majority of household survey respondents in the Far West region reported outages occurring fewer than three times a week (56.0%) or none at all (37.4%).

Figure 13: Frequency of Home Internet Outages per Week by Region (%)



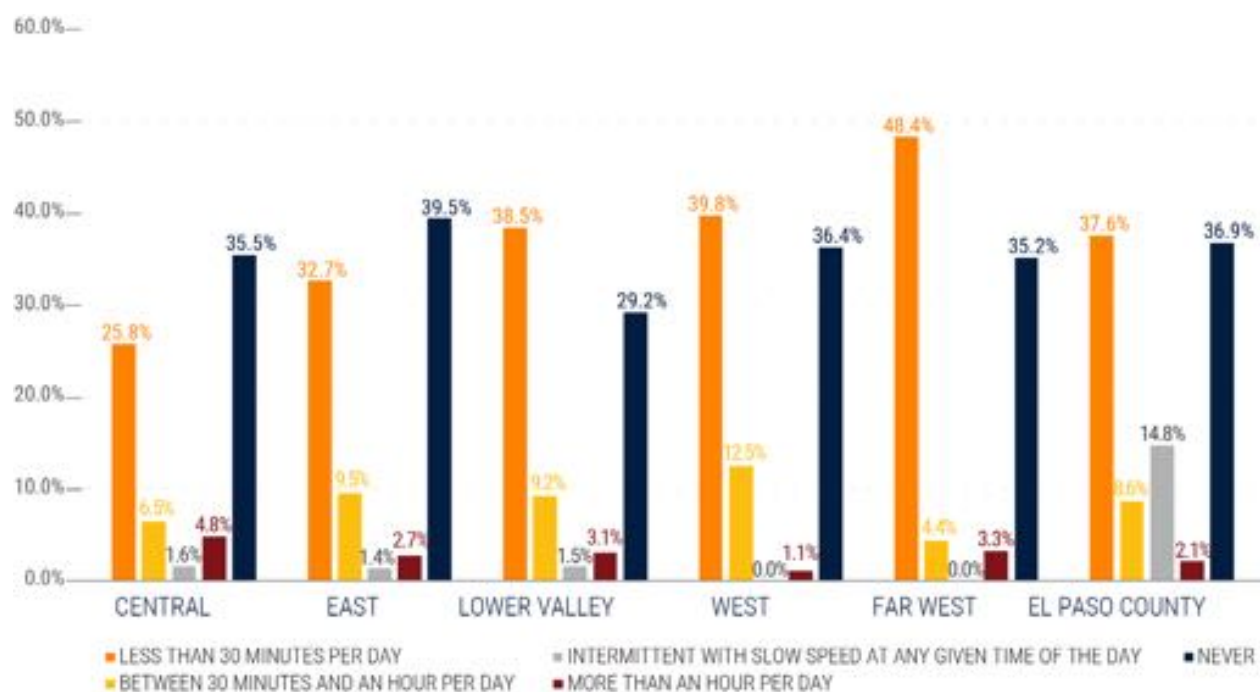
Note: Results are based on the observations of the respondents. Internet outages of any duration. See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Nearly three-fourths of households reported either experiencing internet outages that lasted less than 30 minutes per day (37.6%) due to slow or inoperable internet speeds or not experiencing them at all (36.9%). About 14.8% reported internet outages that were intermittent with slow speed at any given time of the day. About 8.6% of households reported experiencing unavailable or slow internet service between 30 minutes and an hour per day, while 2.1% reported inoperable internet service for more than an hour per day. Thus, about 25.5% of households in El Paso County experience internet outages of more than 30 minutes per day or intermittent outages with slow speeds at any given time of the day.

In the Central region, roughly 35.5% of households reported never experiencing internet outages due to slow or inoperable internet speeds and about 25.8% reported experiencing them for less than 30 minutes per day. Similarly, in the East region, 39.5% of households reported never experiencing internet outages and 32.7% reported experiencing them for less than 30 minutes per day. In the Lower Valley region, 38.5% of households reported outages of less than 30 minutes per day and 29.2% reported never experiencing them. Households from the West region also primarily reported outages of less than 30 minutes per day (39.8%), while 36.4% reported never experiencing them. Households from the Far West region mostly reported outages of less than 30 minutes per day (48.4%), while 35.2% reported never experiencing outages. Households from the El Paso County region mostly reported outages of less than 30 minutes per day (37.6%), while 36.9% reported never experiencing outages.

Figure 14: Average Length of Home Internet Outages per Day by Region (%)



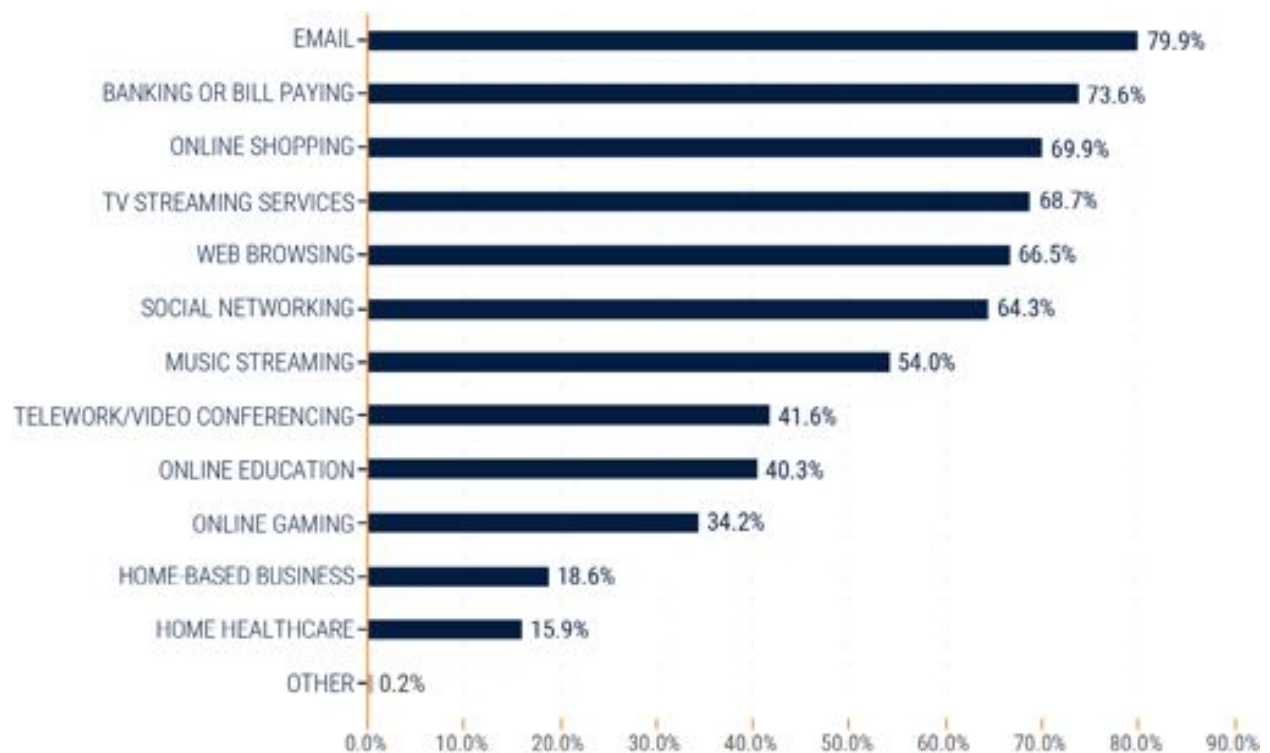
Note: Results are based on the observations of the respondents. Internet outages include interruptions in connection, or slow or inoperable speeds. See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Internet Usage

The most frequent tasks performed online by households are email (79.9%), and banking or bill paying (73.6%). Notably, roughly 80% of respondents used the internet for telework or video conferencing (41.6%) or online education (40.3%), while 18.6% report that they use their internet connection for a home-based business.

Figure 15: Tasks Performed Online by Households (%)

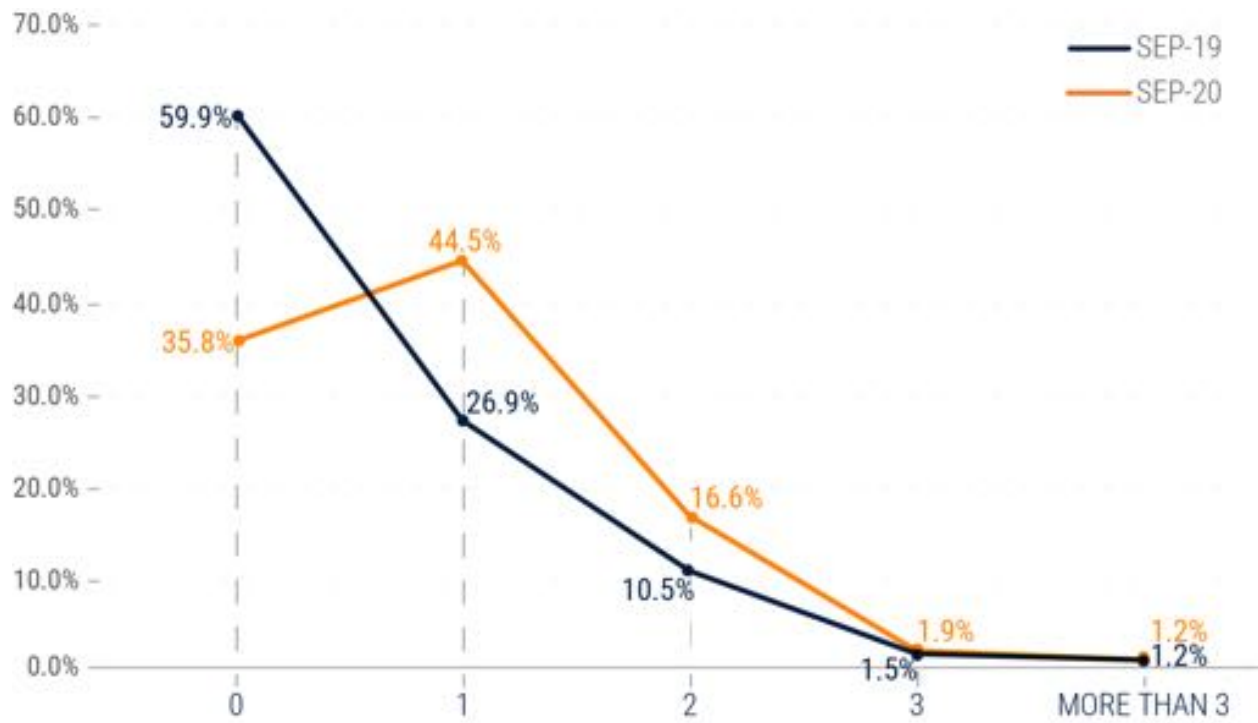


Note: Respondents were directed to select all that apply. Percentages reflect how many households use the internet for each task, not the frequency or amount of time spent per task.

Source: Hunt Institute broadband survey results.

There was a large shift from households having no residents working remotely in September 2019 to having one or two residents per household working remotely in September 2020. In September 2019, 60.0% of the respondents reported having zero residents working remotely, while in September 2020, only 35.8% reported having no residents working from home. The share of households with one resident working remotely increased 17.5% from 27.0% in September 2019 to 44.5% in September 2020. Households with two residents working remotely accounted for 10.5% of respondents in September 2019 and 16.6% in September 2020.

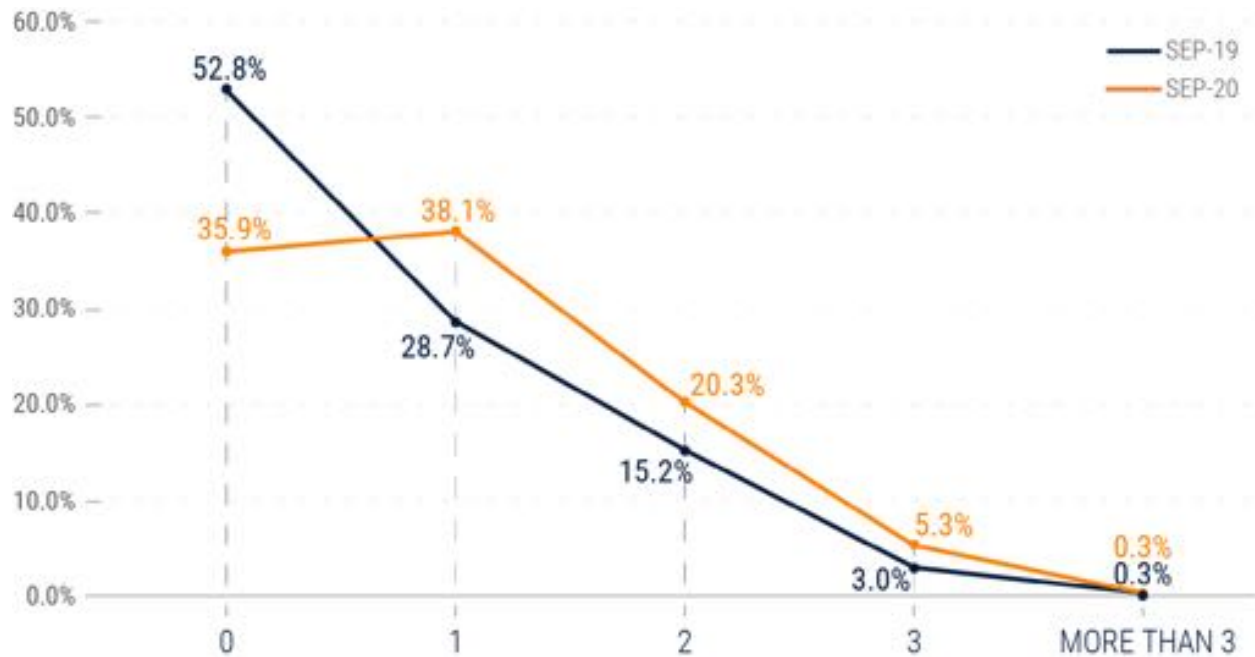
Figure 16: Household Residents Working Remotely from Home, September 2019 vs. September 2020 (%)



Source: Hunt Institute broadband survey results.

The number of households with residents taking online classes also increased noticeably in 2020. Roughly half (52.8%) of the respondents had no residents taking online classes in September 2019, but in September 2020 about two-thirds (64.1%) of respondents had at least one resident taking online classes. Households with one resident taking online classes shifted from 28.7% to 38.1%, while households with two residents taking online classes jumped from 15.2% to 20.3%.

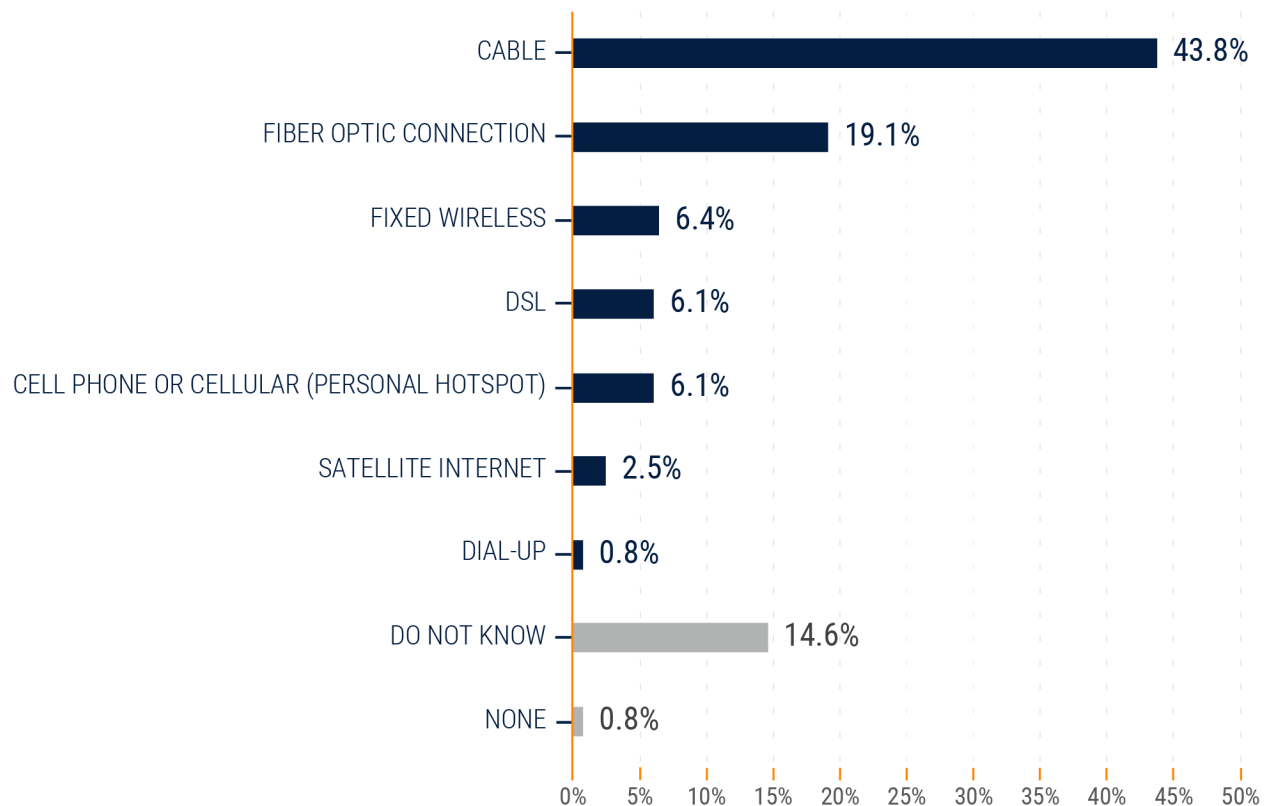
Figure 17: Household Residents Taking Online Classes, September 2019 vs. September 2020 (%)



Source: Hunt Institute broadband survey results.

Cable was the most common type of internet service reported with 43.8% of households using it. The next most common type of internet service was fiber-optic connection with 19.1% of households using it. Fixed wireless was the chosen type of internet service for 6.4% of households, while 6.1% of households used cell phones or cellular (personal hotspot) and 2.5% used satellite internet. About 14.6% reported not knowing what type of internet service they used.

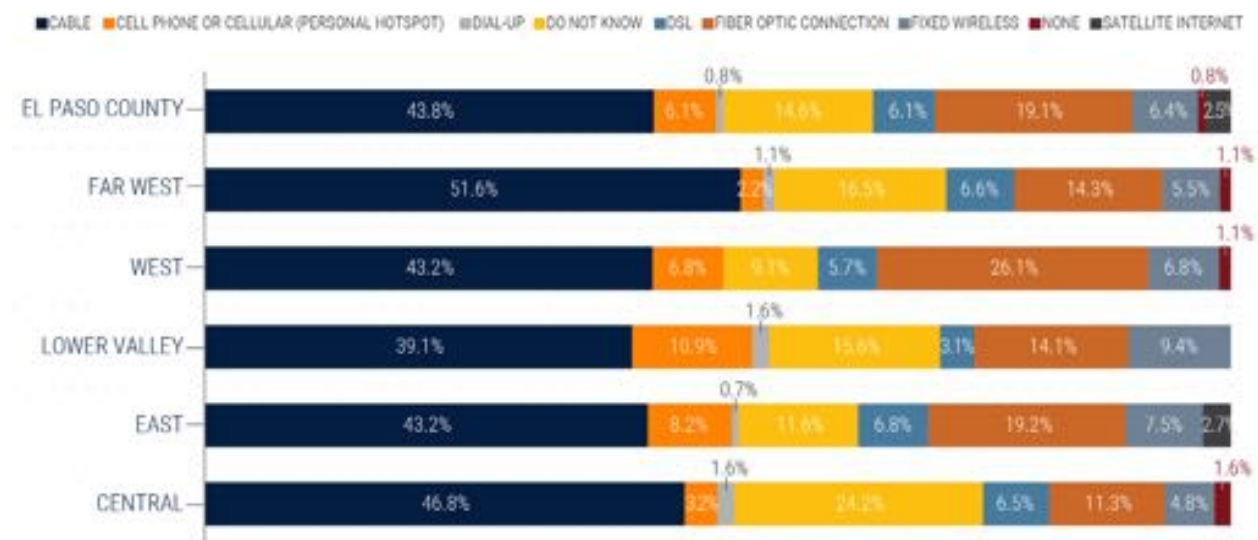
Figure 18: Home Internet Service by Type (%)



Source: Hunt Institute broadband survey results.

For the Far West region, most households also utilize cable (51.6%) or fiber-optic connection (14.3%), while 16.5% reported not knowing what they use. Respondents from the West region largely reported utilizing either cable (43.2%) or fiber-optic connection (26.1%) for their internet service. In the Lower Valley region, 39.1% of households utilize cable for their internet service and 10.9% use cell phones or cellular (personal hotspot). Households from the East region use cable (43.2%) and fiber-optic connection (19.2%) the most for their internet service, while 8.2% use cell phones or cellular (personal hotspot). Nearly a quarter (24.2%) of households from the Central region reported not knowing what type of internet service they utilized, while 46.8% reported using cable and 11.3% reported using fiber-optic connection.

Figure 19: Home Internet Service by Type per Region (%)



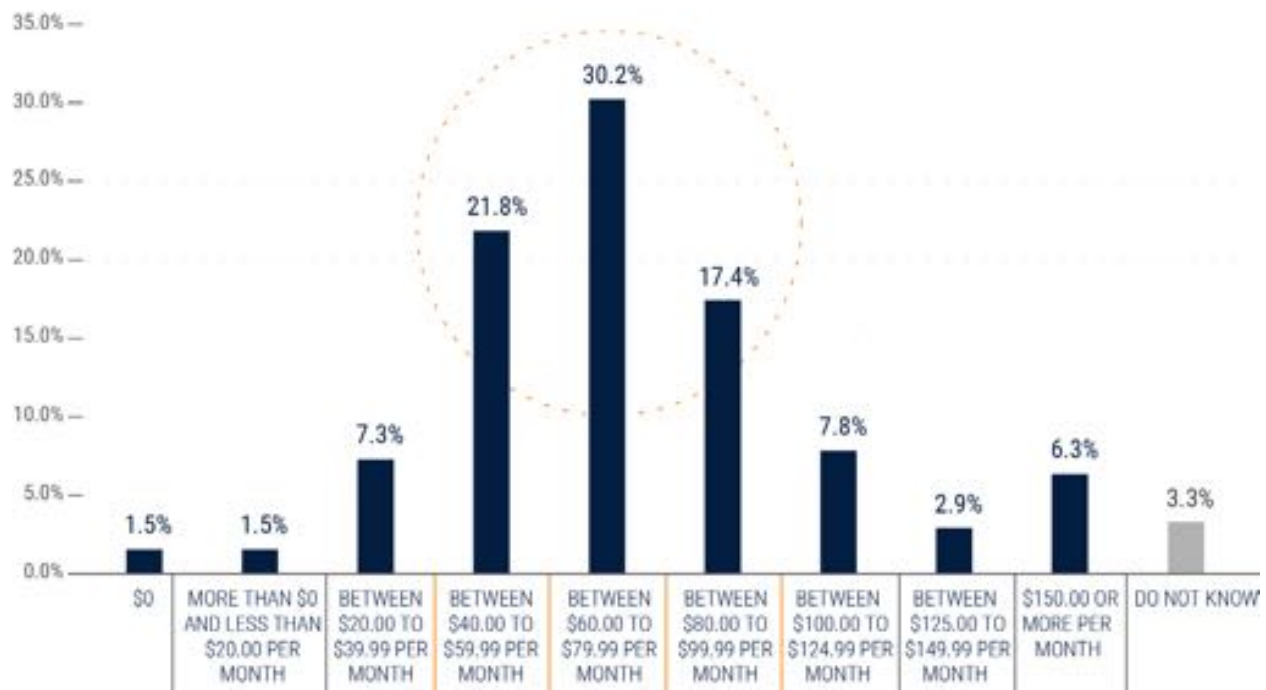
Note: See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Internet Cost

More than half of the respondents reported paying between \$60.00 and \$79.99 per month (30.2%) or between \$40.00 and \$59.99 per month (21.8%) for their internet service. Households paying between \$80.00 and \$99.99 per month made up 17.4% of respondents, and those paying \$150.00 or more per month accounted for 6.3%. 3.3% reported not knowing what they paid per month.

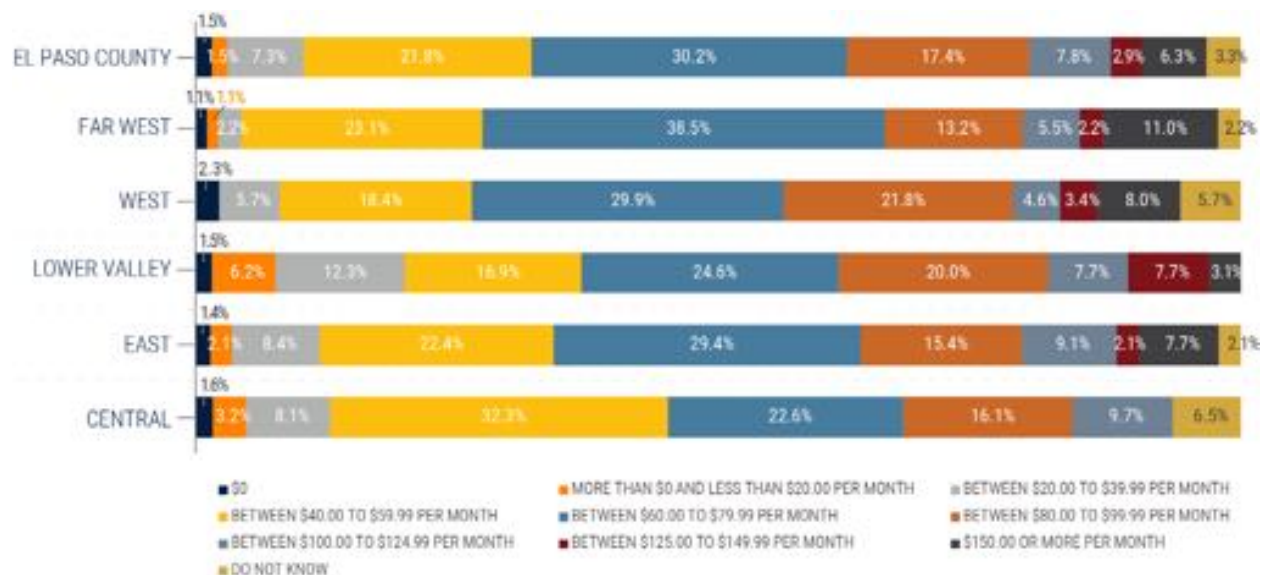
Figure 20: Amount Paid for Internet Service per Month (%)



Source: Hunt Institute broadband survey results.

Nearly two-thirds of the respondents from the Far West region reported paying between \$60.00 and \$79.99 per month (38.5%) or \$40.00 and \$59.99 per month (23.1%) for their internet service. Nearly a third (29.9%) of the respondents from the West region reported paying between \$60.00 and \$79.99 per month for their internet service. Households paying between \$60.00 and \$79.99 per month made up 24.6% of households from the Lower Valley region. Households paying between \$60.00 and \$79.99 per month made up 29.4% of households from the East region. In the Central region, almost a third (32.3%) of households reported paying between \$40.00 and \$59.99 per month.

Figure 21: Amount Paid for Internet Service per Month by Region (%)



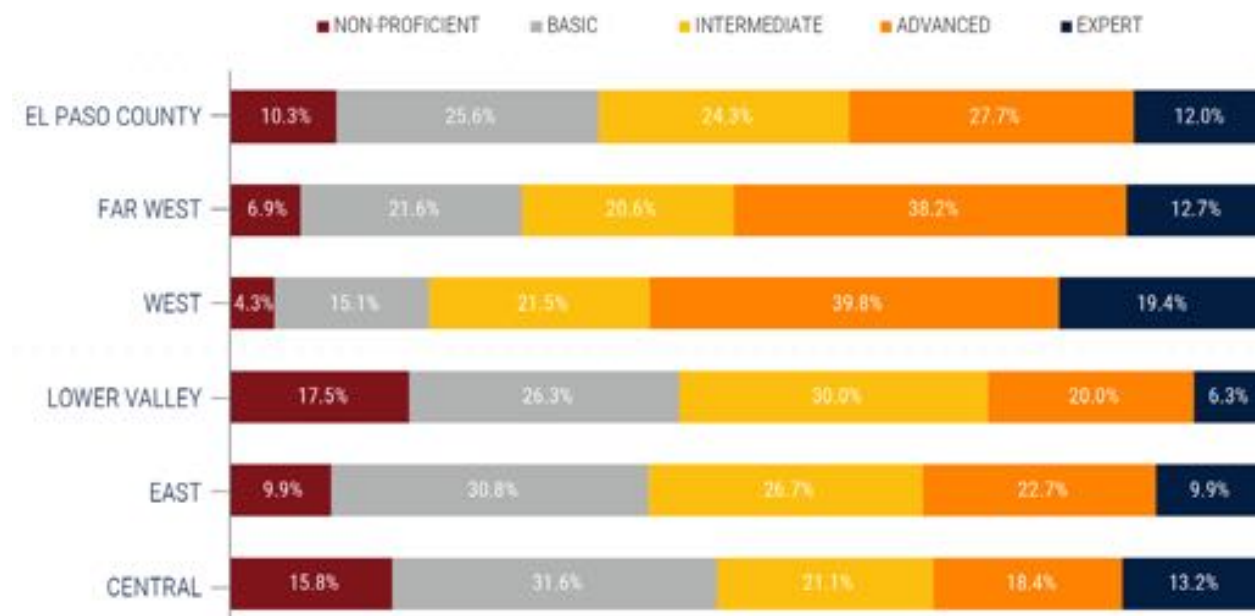
Note: See methodology for zip code list by region.
Source: Hunt Institute broadband survey results.

Digital Literacy

Digital literacy was assessed through asking respondents about their skill level with respect to Microsoft Office and searching the internet for information. Overall, 27.7% of El Paso County households reported the head of household having advanced skills with Microsoft Office and searching for information on the internet, while 10.3% reported being nonproficient.

More than a third of both Far West region respondents (38.2%) and West region respondents (39.8%) reported the head of household having advanced skills with Microsoft Office and internet browsing. In the Lower Valley region, 30.0% of respondents reported the head of household had intermediate skills. About a third of both East region respondents (30.8%) and Central region respondents (31.6%) reported the head of household having basic skills with Microsoft Office and searching for information on the internet. Households from the Lower Valley region (17.5%) and the Central region (15.8%) had the largest shares of heads of household who were nonproficient with Microsoft Office and internet browsing.

Figure 22: Head of Household's Skill Level with Microsoft Office and Internet Browsing for Information per Region (%)



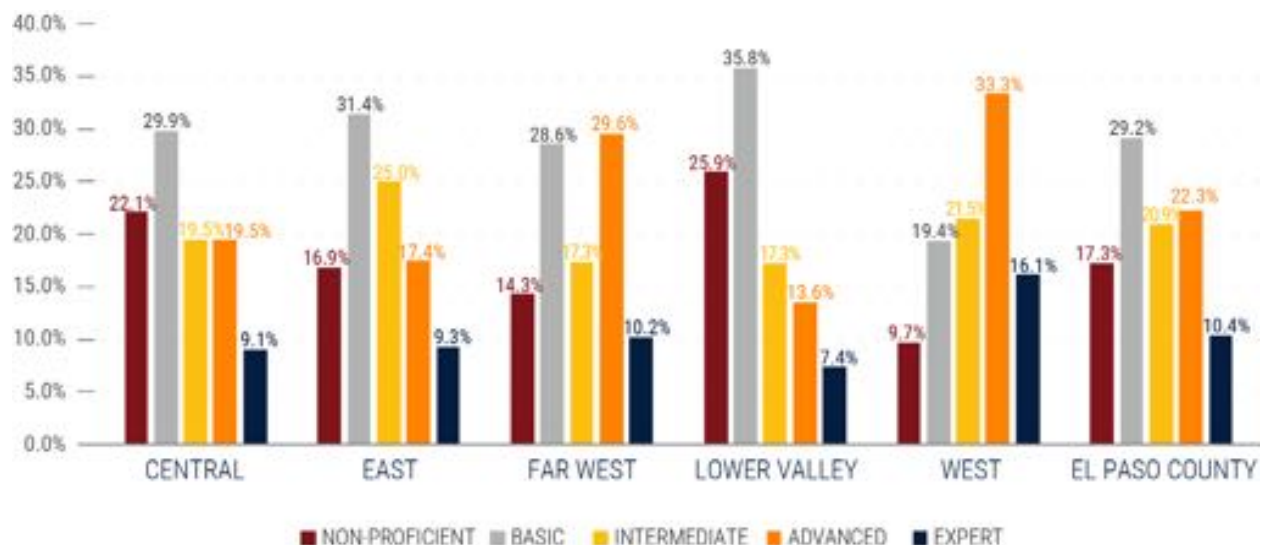
Note: Results are based on the opinions of the respondents. See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Digital literacy was also assessed through asking respondents about their skill level with respect to online communication platforms. At the county level, 29.2% of the heads of household have basic skills with online communication platforms, 22.3% have advanced skills (lower than for Microsoft Office and internet browsing), and 17.3% are nonproficient (higher than for Microsoft Office and internet browsing). The high nonproficiency rate highlights the need for making training available so that people can successfully telework or access remote education.

Roughly a third of Central region respondents (29.9%), East region respondents (31.4%), and Lower Valley region respondents (35.8%) reported the head of household having basic skills in terms of using online communication platforms. Nearly a third of Far West region respondents (29.6%) and West region respondents (33.3%) reported the head of household having advanced skills with online communication platforms. Once again, the Lower Valley (25.9%) and Central (22.1%) regions had the largest shares of nonproficiency with respect to online communication platforms.

Figure 23: Head of Household's Skill Level with Online Communication Platforms per Region (%)



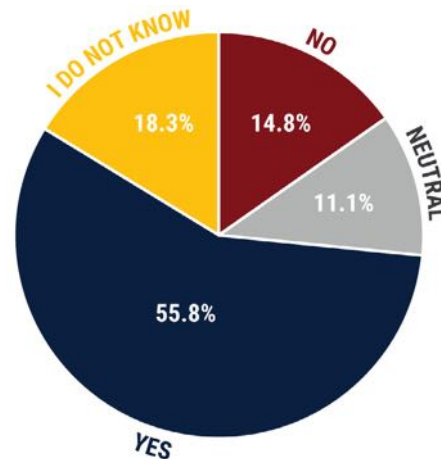
Note: Results are based on the opinions of the respondents. Online platforms used to communicate with work-related peers such as Zoom, Microsoft Teams, Skype, and e-mail (such as Outlook). See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Household Approval of El Paso County Offering Broadband Services

Over half (55.8%) of the respondents reported approving of El Paso County, or one of its partners, offering internet services, even if they compete with private-sector companies. About 14.8% disapproved of such a proposal, while 18.3% said they do not know and 11.1% were neutral.

Figure 24: Household Approval of El Paso County Providing Internet Services (%)

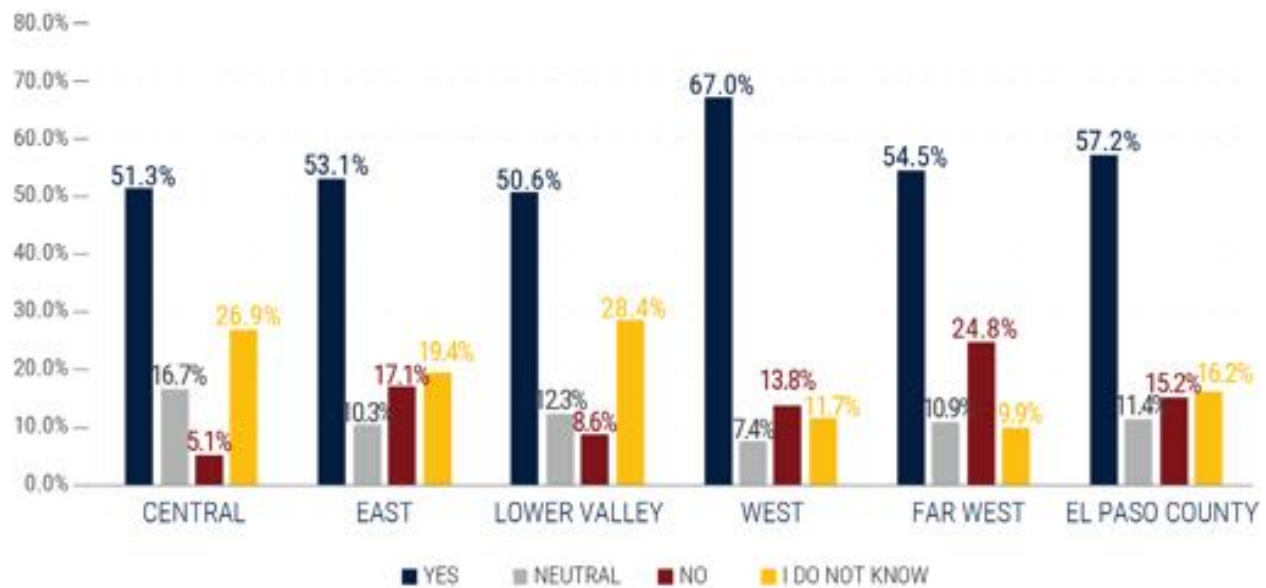


Note: Results are based on the opinions of the respondents.

Source: Hunt Institute broadband survey results.

The majority of respondents in the Central (51.3%), East (53.1%), Lower Valley (50.6%), West (67.0%), and Far West regions (54.5%) approved of El Paso County providing internet services.

Figure 25: Household Approval of El Paso County Providing Internet Services by Region (%)



Note: Results are based on the opinions of the respondents.

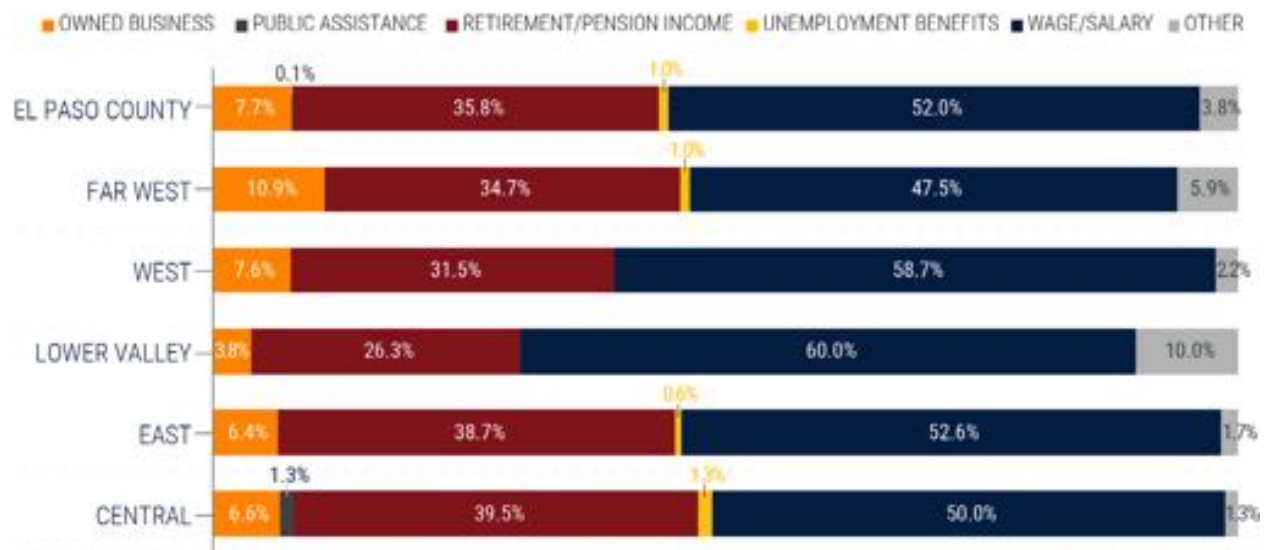
Source: Hunt Institute broadband survey results.

Income

Most respondents in El Paso County reported wages or salary (52.0%), or retirement or pension income (35.8%) as the main source of income for the household. Owning a business as the primary source of income was reported by 7.7% of respondents.

For the Far West region, nearly half (47.5%) of respondents also reported wages or salary as the main source of income, while 34.7% reported retirement or pension income as the main source of income. Nearly two-thirds of West (58.7%) and Lower Valley (60.0%) region respondents reported wages or salary as the main source of income for the household. Likewise, households from the East (52.6%) and Central (50.0%) regions largely reported wages or salary as the main source of income.

Figure 26: Household's Major Source of Income by Region, 2019 (%)



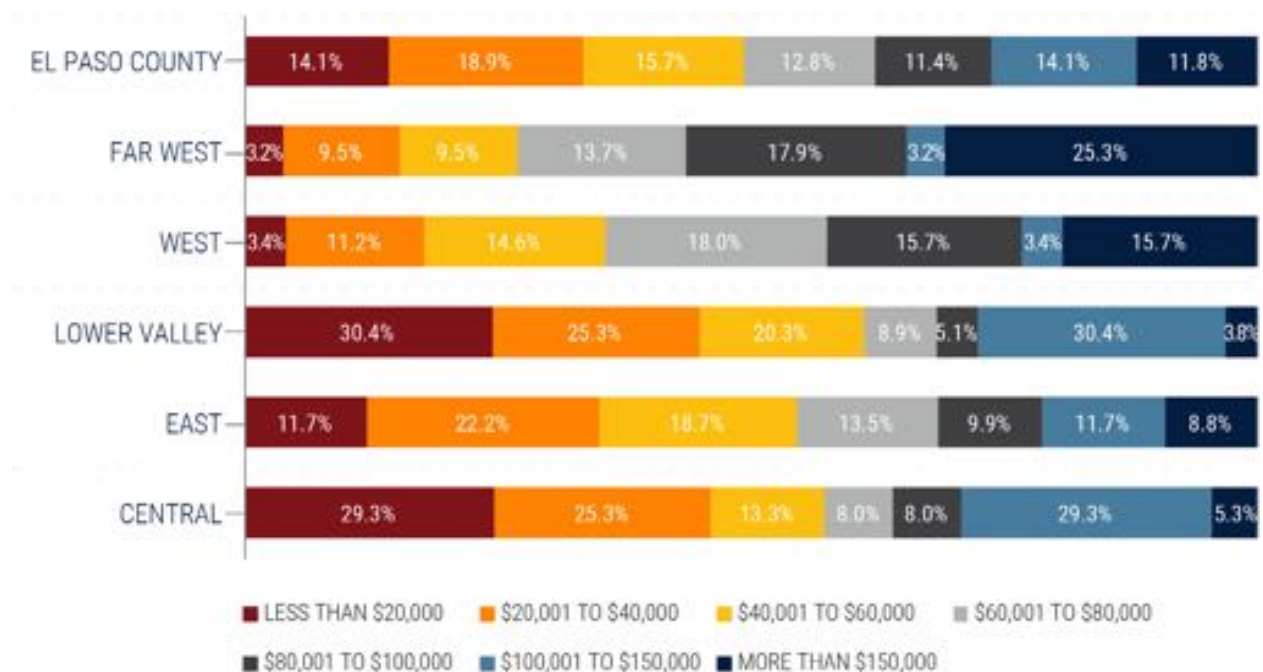
Note: See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Most households in El Paso County (18.9%) reported annual gross income between \$20,001 and \$40,000, while 15.7% reported income between \$40,001 and \$60,000 and 14.1% reported income less than \$20,000. Thus, a third (33.0%) of households in El Paso County reported income of \$40,000 or less.

In the Far West region, 25.3% of households reported annual gross income of more than \$150,000. About 18.0% of households from the West region reported annual gross income between \$60,001 and \$80,000 and 15.7% reported income more than \$150,000. In the Lower Valley region, 30.4% reported income between \$100,001 and \$150,000 and another 30.4% reported income of less than \$20,000. More than a fifth (22.2%) of households from the East region reported annual gross income between \$20,001 and \$40,000, while 29.3% of households from the Central region reported annual gross income less than \$20,000, and 29.3% reported income between \$100,001 and \$150,000. Thus, the Lower Valley (55.7%), Central (54.6%), and East (33.9%) regions had the largest shares of respondents with annual gross income of \$40,000 or less.

Figure 27: Household's Annual Gross Income by Region, 2019 (%)

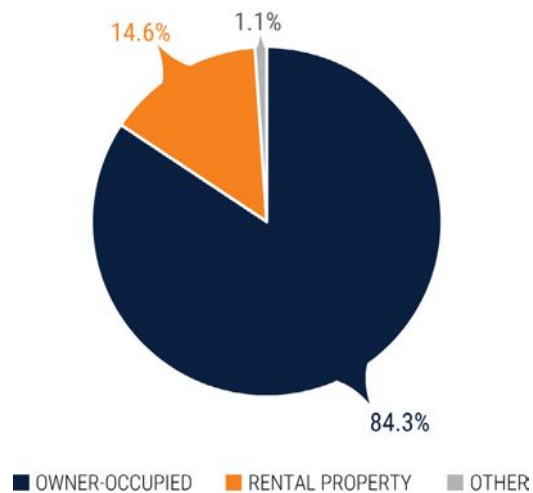


Note: Gross income before taxes. See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

A significant majority of respondents (84.3%) reported living in an owner-occupied residence, while 14.6% reported living in a rental property.

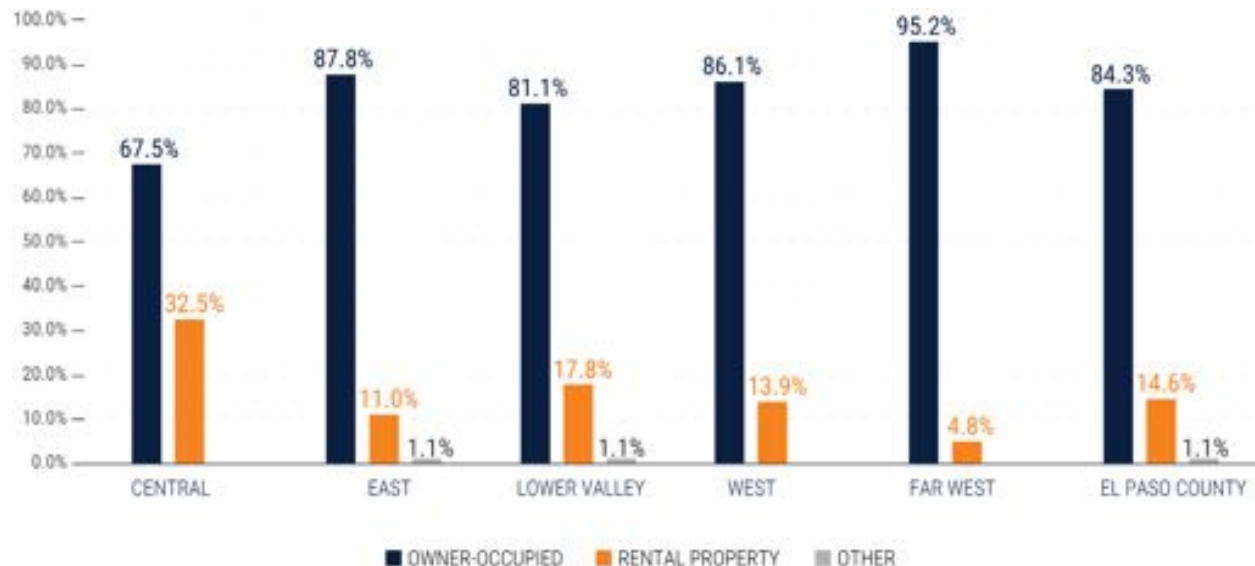
Figure 28: Type of Residence (%)



Source: Hunt Institute broadband survey results.

The Far West region had the largest share of respondents living in owner-occupied residences at 95.2%. This share was also very high for residents of the East and West regions, at 87.8% and 86.1% respectively. In contrast, only 67.5% of respondents from the Central region lived in owner-occupied residences.

Figure 29: Type of Residence by Region (%)

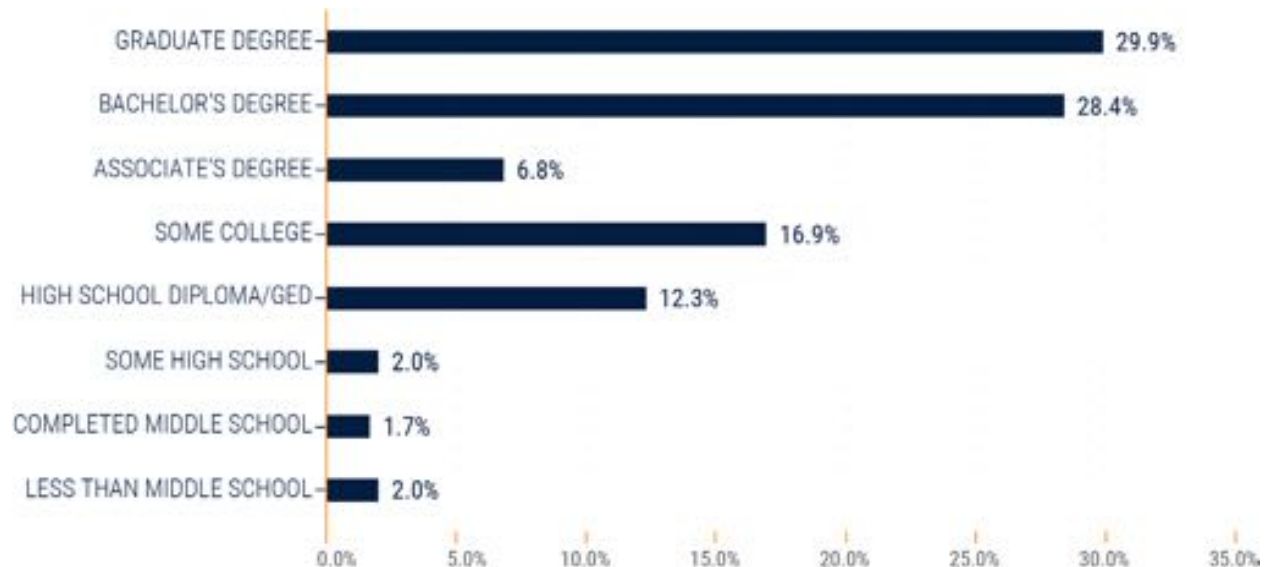


Source: Hunt Institute broadband survey results.

Education

About 29.9% of the heads of household reported a graduate degree as the highest level of education attained and 28.4% reported a bachelor's degree. Some college and high school diploma/GED were the next highest levels of educational attainment at 16.9% and 12.3%, respectively.

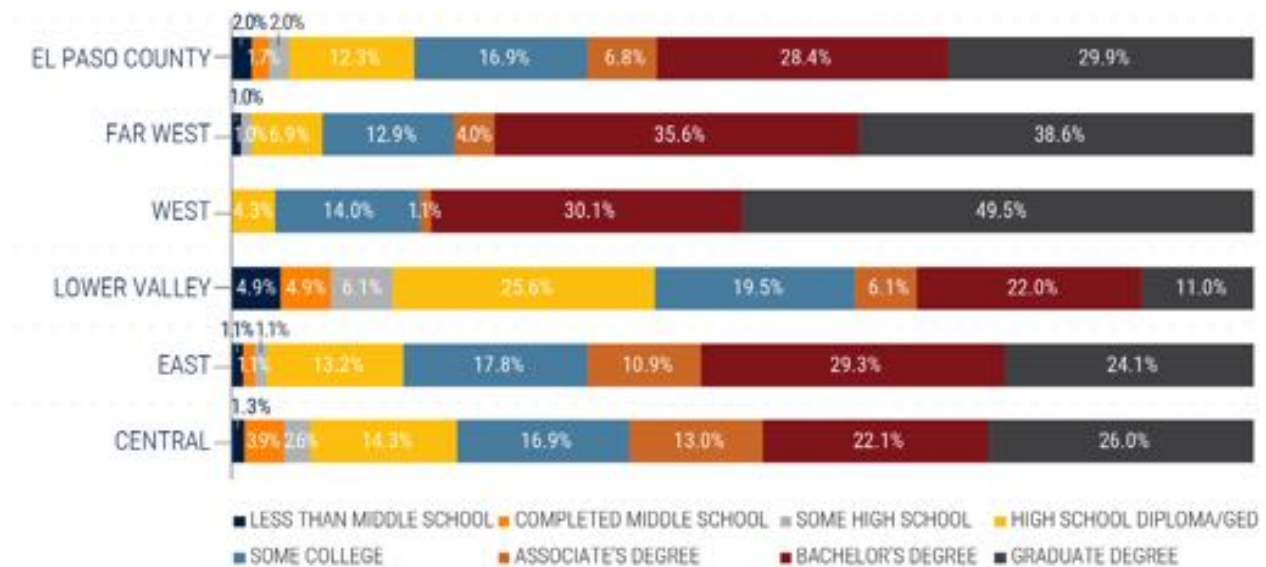
Figure 30: Highest Level of Education Completed by Head of Household (%)



Source: Hunt Institute broadband survey results.

From the Far West region, over a third (38.6%) of the heads of household reported a graduate degree as the highest level of education attained. From the West region, nearly half (49.5%) of the heads of household reported a graduate degree as the highest level of education attained. From the Lower Valley region, a fourth (25.6%) of the heads of household reported a high school diploma or GED as the highest educational attainment level. About 29.3% of the heads of household from the East region reported a bachelor's degree as the highest level of education attained, while 26.0% of the heads of household from the Central region reported a graduate degree as the highest level of education attained.

Figure 31: Highest Level of Education Completed by Head of Household per Region (%)



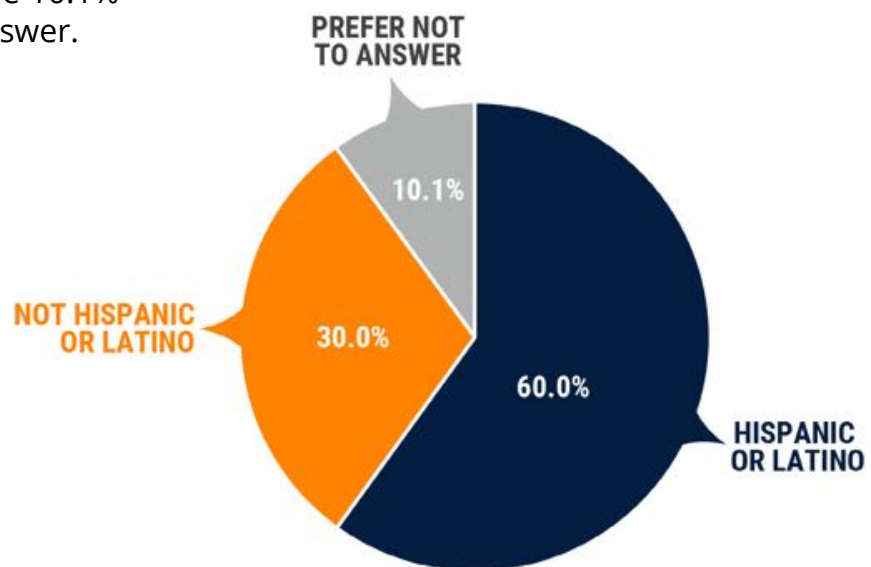
Note: See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Respondent Ethnicity and Sex

Most of the respondents identified as Hispanic or Latino (60.0%), while 10.1% preferred not to answer.

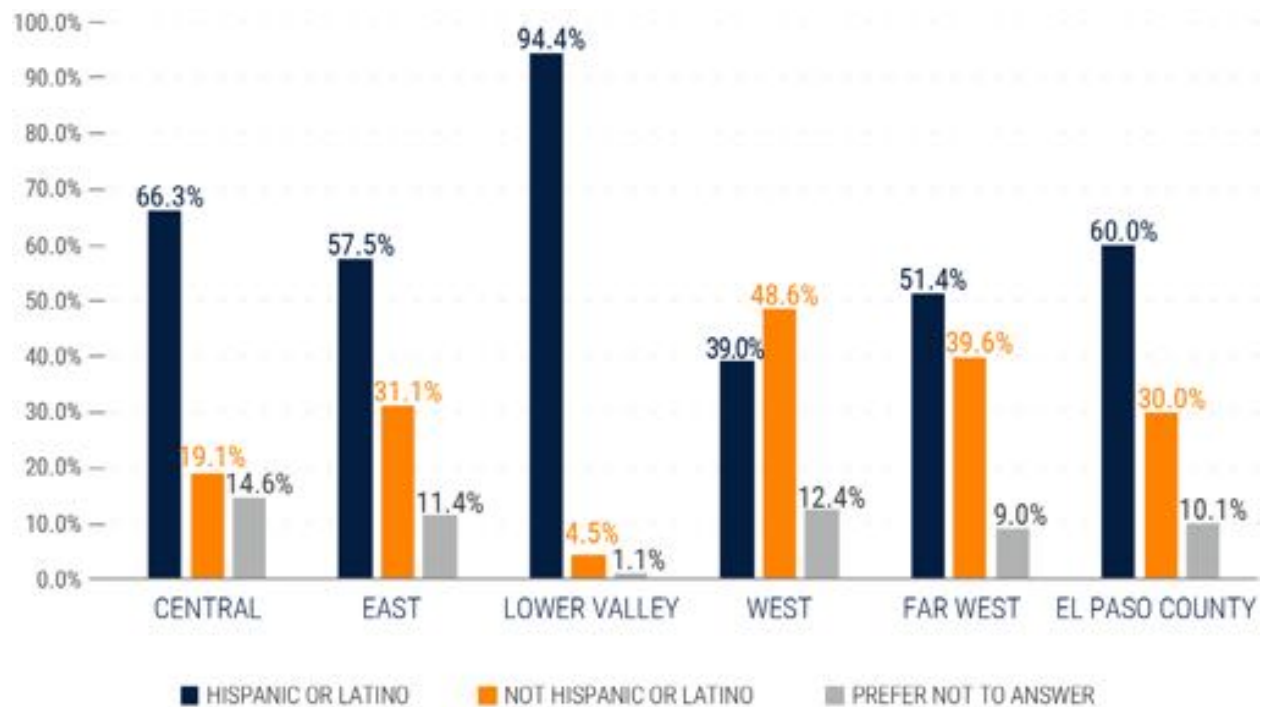
Figure 32: Ethnicity of the Head of Household (%)



Source: Hunt Institute broadband survey results.

In the Central region, 66.3% of respondents were Hispanic or Latino. Hispanic or Latino respondents accounted for 57.5% of the respondents from the East region, 94.4% from the Lower Valley region, 39.0% from the West region, and 51.4% from the Far West region. 51.4% from the Far West region.

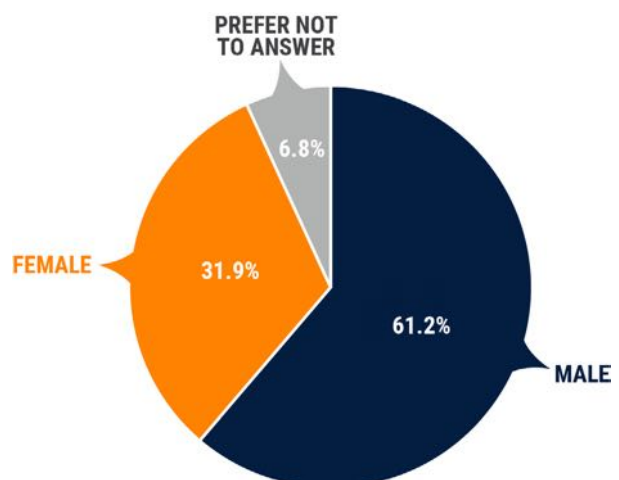
Figure 33: Ethnicity of the Head of Household by Region (%)



Note: See methodology for zip code list by region.
Source: Hunt Institute broadband survey results.

The majority of the heads of household identified as male (61.2%), while 31.9% identified as female.

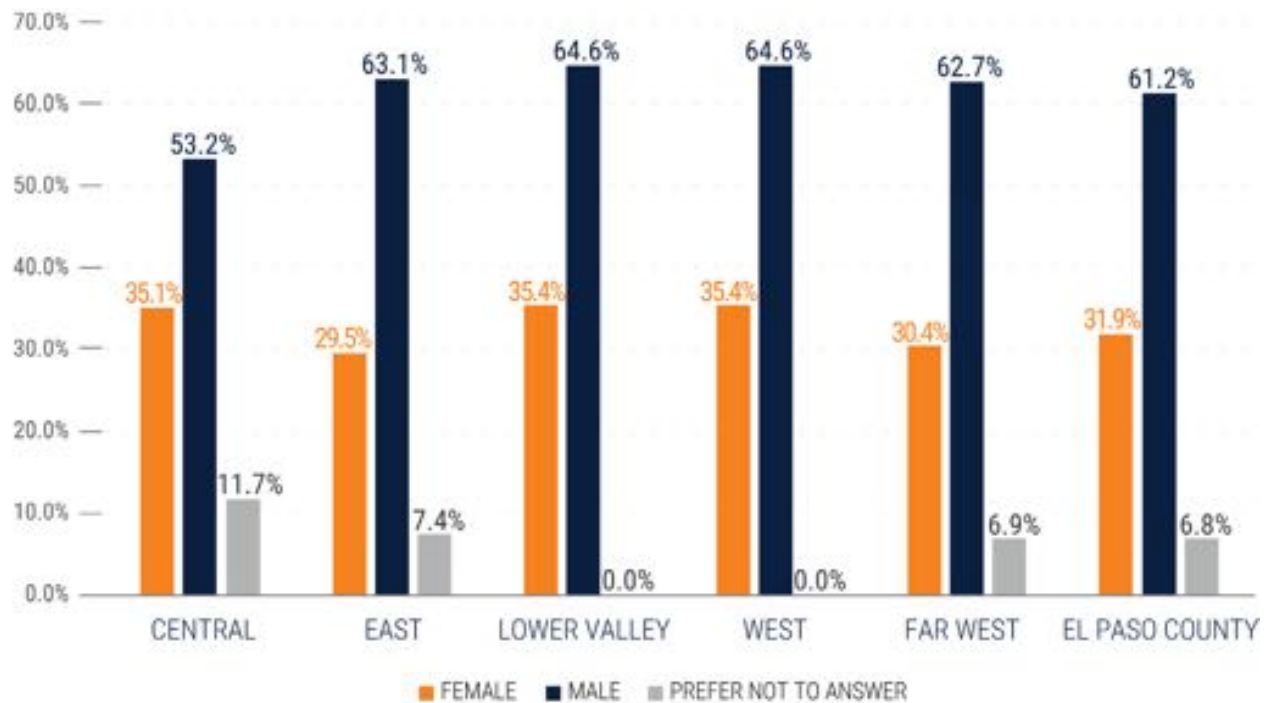
Figure 34: Gender of the Head of Household (%)



Source: Hunt Institute broadband survey results.

The majority of the heads of household identified as male in the Central (53.2%), East (63.1%), Lower Valley (64.6%), West (64.6%), and Far West (62.7%) regions.

Figure 35: Gender of the Head of Household by Region (%)



Note: See methodology for zip code list by region.

Source: Hunt Institute broadband survey results.

Findings from Residential Focus Groups

Residential Study Focus Group Summary

The Hunt Institute conducted a focus group with four El Paso County residents to gain a deeper understanding of their experience with broadband internet service in the region. The participants were asked ten questions related to their broadband service needs following COVID-19.

Participant Occupation and Primary Use for Internet

- **Participant #1:** A freelance reporter whose main use of internet is to navigate on the web to gather information related to the development of articles and sending publications to other colleagues.
- **Participant #2:** A musician who uses the internet for entertainment. This participant did not experience negative or positive internet effects concerning the broadband infrastructure quality at the start or during the ongoing pandemic.
- **Participant #3:** A legal counsel advisor who uses the internet for entertainment, communication, e-commerce, and educational purposes. This participant experienced internet outages at least five days a week after 6:00 pm.
- **Participant #4:** A teacher who uses the internet for e-commerce, education, and general communication. This participant reported a negative effect with cloud-based video conferencing platforms with her home internet connection and with her students' internet connections during online classes.

Key Takeaways

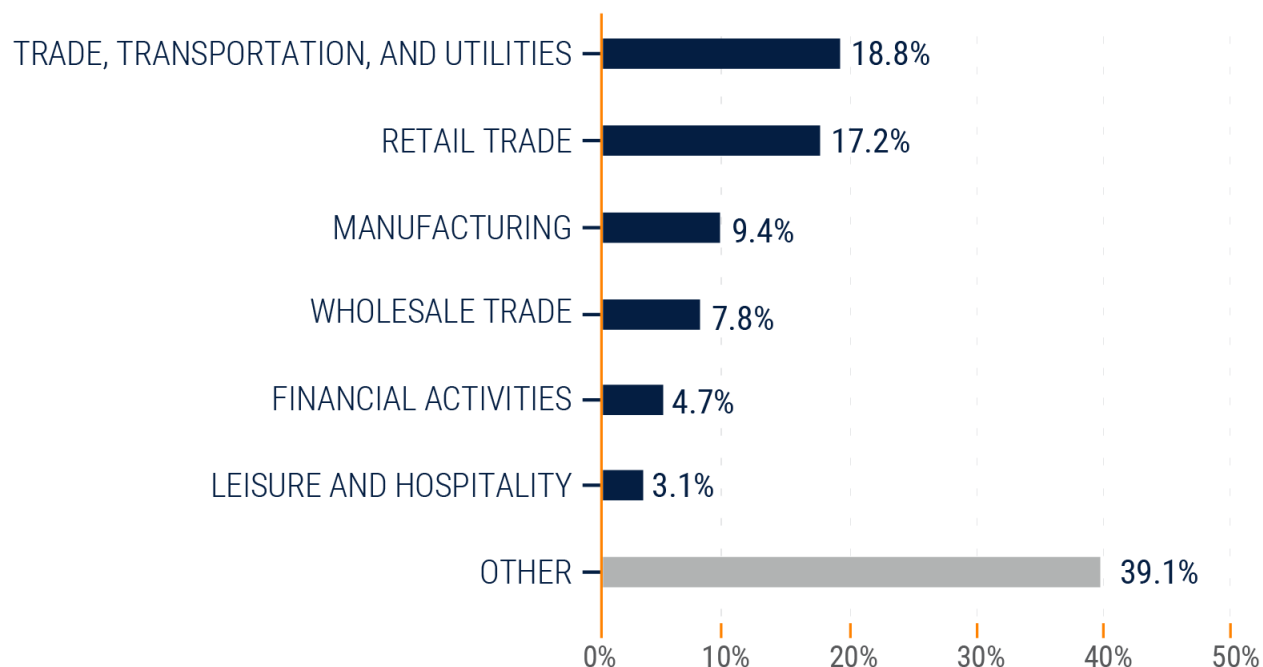
- All participants reported experiencing internet interruptions regardless of the speed of their internet connection.
- The participants expressed that the need for high-speed, affordable, and reliable internet is paramount to explore new areas for education, communication, and business.
- Reliable high-speed internet enriches education and will allow more flexibility in working schedules and telework.
- Four out of five respondents expressed negative effects of broadband infrastructure quality during the pandemic and suggested that internet providers offer competitive prices and improve the quality of broadband services.

Findings from Business Surveys

Business Survey Participants by Industry Sector

The largest portion of survey respondents belonged to the trade, transportation, and utilities sector (18.8%), and to the retail trade sector (17.2%). Manufacturing (9.4%), and wholesale trade (7.8%) were the next largest sectors. Businesses in the financial activities, and leisure and hospitality sectors accounted for 4.7% and 3.1%, respectively, of survey responses. Businesses in other sectors not listed made up 39.1% of responses.

Figure 36: Survey Responses by Sector (%)

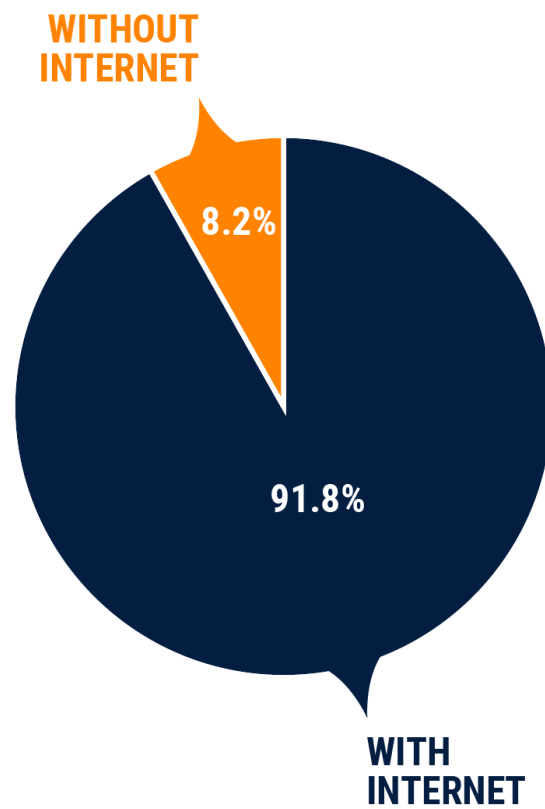


Source: Hunt Institute for broadband survey results.

Broadband Access

The vast majority of businesses responded as having internet service (91.8%) while only 8.2% of businesses reported not having an internet connection.

Figure 37: Businesses with and without Internet (%)

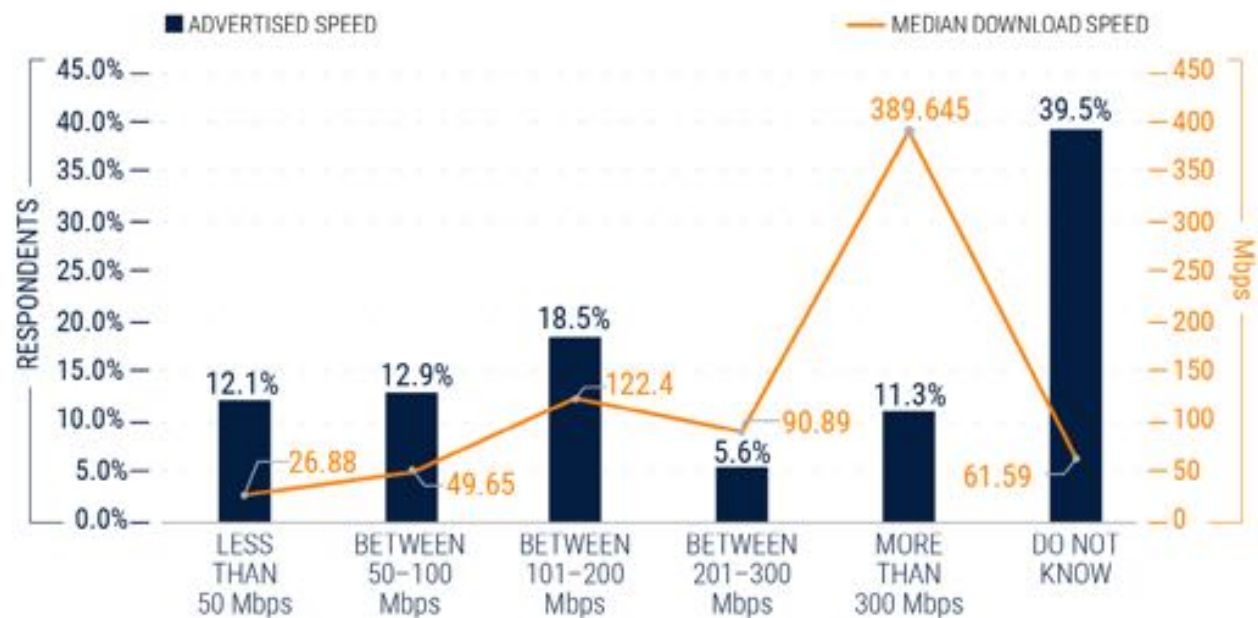


Source: Hunt Institute broadband survey results.

Broadband Speeds

The largest share of businesses does not know their billed, advertised internet range (39.5%). The next largest share (18.5%) reported paying for a download speed between 101 Mbps and 200 Mbps. This was followed by billed download speeds between 50 Mbps and 100 Mbps (12.9%) and less than 50 Mbps (12.1%). The actual median download speed was not within the advertised range for businesses paying for between 50 Mbps and 100 Mbps (49.65 Mbps) and for those paying for between 201 Mbps and 300 Mbps (90.89 Mbps).

Figure 38: Download Speed by Advertised Range (%) vs. Median Download Speed by Range (Mbps)

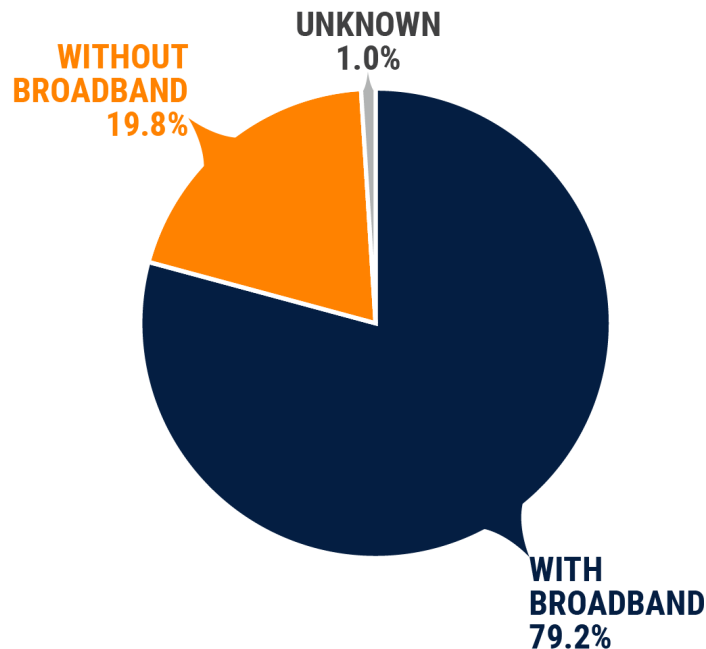


Note: Percentages represents the shares of businesses by the advertised download speed range they are billed for. Median download speeds correspond to the actual download speeds reported by the businesses from each download speed range.

Source: Hunt Institute broadband survey results.

Of the businesses with internet connections, 19.8% reported download and upload speeds that did not meet the FCC's minimum requirements for broadband. Businesses reported their download and upload speeds by logging into a speed test website and testing their internet connection.

Figure 39: Businesses with Internet That Meets FCC's Minimum Broadband Standards (%)

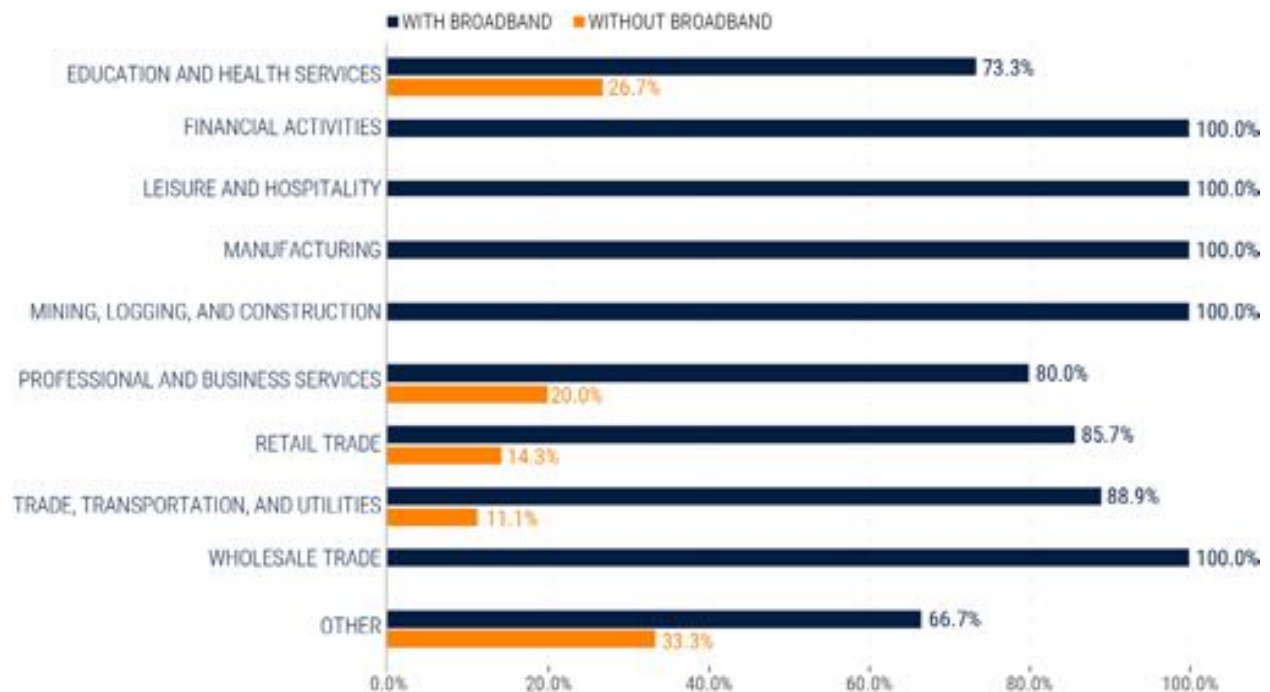


Note: The Hunt Institute uses the FCC definition of broadband as 25 Mbps for download speed and 3 Mbps for upload speed. Respondents who have internet but did not match or exceed FCC download and upload speeds were listed as not having broadband. Businesses reported their download and upload speeds by logging into a speed test website and testing their internet connection.

Source: Hunt Institute broadband survey results.

About a fourth (26.7%) of businesses in the education and health services sector reported download and upload speeds that did not meet the FCC's minimum requirements for broadband, while 20.0% of businesses in the professional and business services sector also did not meet the minimum requirements. Approximately 14.3% of the retail trade sector and 11.1% of the trade, transportation, and utilities sector were without broadband.

Figure 40: Businesses with Internet that Meets FCC's Minimum Broadband Standards by Sector (%)



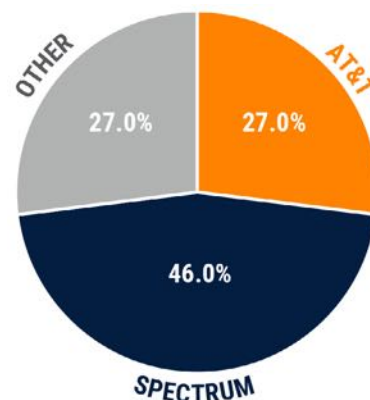
Note: The Hunt Institute uses the FCC definition of broadband as 25 Mbps for download speed and 3 Mbps for upload speed. Respondents who have internet but did not match or exceed FCC download and upload speeds were listed as not having broadband. Businesses reported their download and upload speeds by logging into a speed test website and testing their internet connection.

Source: Hunt Institute broadband survey results.

Main Internet Providers

Most businesses (46.0%) use Spectrum as their main internet provider for business computers, laptops, tablets, and TVs. AT&T was the next largest provider at 27.0%, while all other providers accounted for 27.0%.

Figure 41: Main Internet Provider for Business Computers, Laptops, Tablets, and TVs (%)

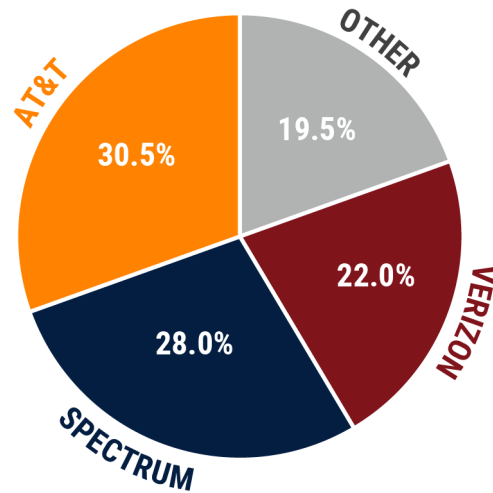


Note: Other includes T-Mobile, Verizon, Metro by T-Mobile, Sprint, Viasat, West Central Net, Vivint, JackRabbit, HughesNet, Boost Mobile, and others that were unspecified by the respondent.

Source: Hunt Institute broadband survey results.

While for business computers, laptops, tablets, and TVs there are two main providers covering nearly 50% of the market, for mobile phones there is higher market participation. Nearly a third of business respondents (30.5%) use AT&T as their main internet provider for mobile phones, followed by Spectrum (28.0%), and Verizon (22.0%). All other providers accounted for 19.5%.

Figure 42: Main Internet Provider for Mobile Phones (%)



Note: Other includes T-Mobile, Metro by T-Mobile, Sprint, Viasat, West Central Net, and others not specified by the respondent.

Source: Hunt Institute broadband survey results.

Quality of Internet Services

In terms of connection quality, 18.3% of businesses rated their internet connection as excellent, 38.3% rated their connection as good, 30.4% rated it as average, and 13.0% reported a poor business internet connection.

Figure 43: Quality of Business Internet Connection (%)



Note: Results are based on the opinions of the respondents.

Source: Hunt Institute broadband survey results.

Over 40% of businesses that use AT&T for their internet reported their connection to be good (44.4%), while 33.3% rated their connection as average, and 22.2% rated it as excellent. For Spectrum users, 42.1% of businesses rated their internet connection as average, 26.3% rated it as excellent, 21.1% rated it as good, and 10.5% rated it as poor. Two-fifths (40.0%) of those with other providers rated their connection as poor.

Table 4: Quality of Business Internet Connection by Provider (%)

QUALITY	SPECTRUM	AT&T	OTHER
EXCELLENT	26.3%	22.2%	6.7%
GOOD	21.1%	44.4%	33.3%
AVERAGE	42.1%	33.3%	20.0%
POOR	10.5%	0.0%	40.0%
GRAND TOTAL	100.0%	100.0%	100.0%

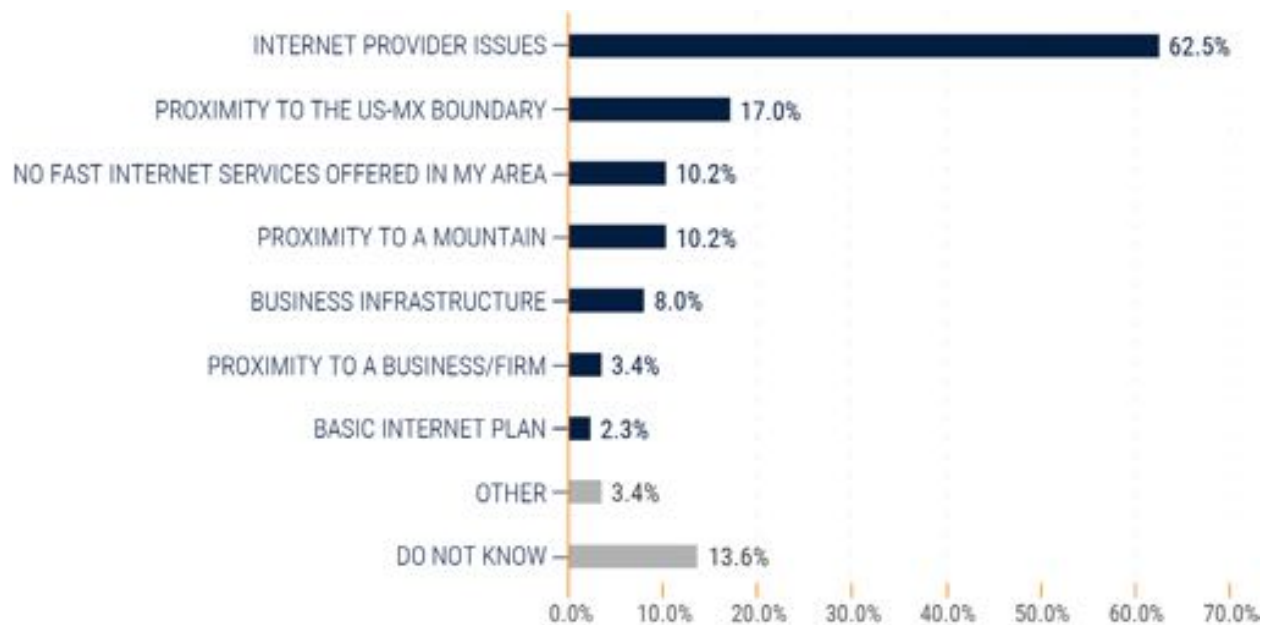
Note: Results are based on the opinions of the respondents. Other includes Boost Mobile, HughesNet, JackRabbit, Metro by T-Mobile, Sprint, T-Mobile, Verizon, Viasat, Vivint Internet, West Central Net, and others not denoted.

Source: Hunt Institute broadband survey results.

Internet Outages

Nearly two-thirds (62.5%) of businesses attributed their internet connection disruptions to internet provider issues, and 17.0% attributed their connection issues to proximity with the U.S.-Mexico border.

Figure 44: Causes of Internet Connection Interruptions (%)

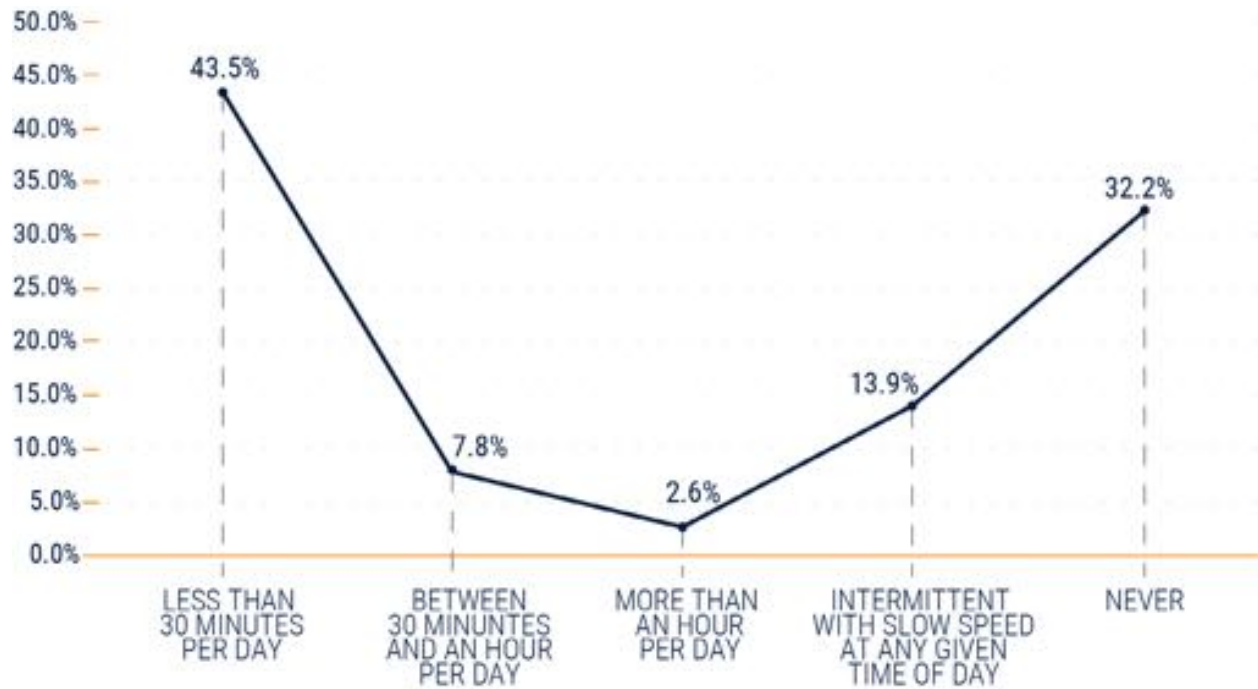


Note: Results are based on the opinions of the respondents. Respondents were directed to select all that apply, thus, percentages will not sum up to 100.

Source: Hunt Institute broadband survey results.

About 43.5% of businesses reported internet outages that lasted less than 30 minutes per day due to slow or inoperable internet speeds, while 13.9% reported internet outages that were intermittent with slow speed at any given time of the day. About 7.8% of businesses reported experiencing unavailable or slow internet service between 30 minutes and an hour per day, while 2.6% reported inoperable internet service for more than an hour per day. Nearly a third of businesses (32.2%) said they never experienced slow or inoperable internet services.

Figure 45: Average Length of Business Internet Outages per Day (%)



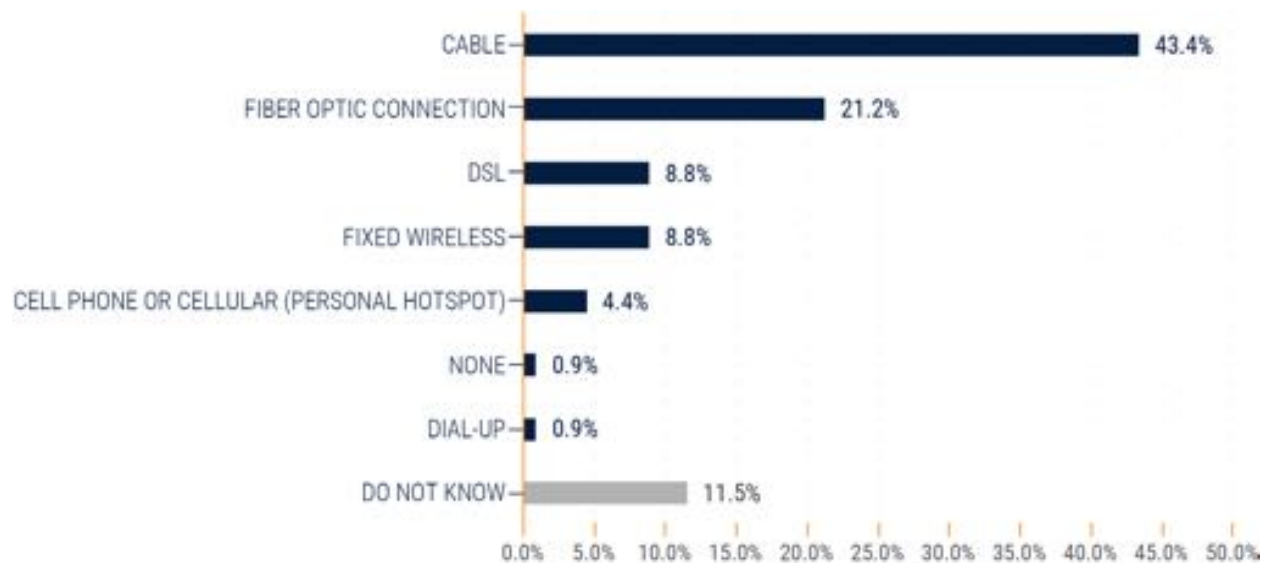
Note: Results are based on the observations of the respondents. Internet outages include interruptions in connection or slow or inoperable speeds.

Source: Hunt Institute broadband survey results.

Internet Usage

Cable was the most common type of internet service reported with 43.4% of businesses using it. The next most common type of internet service was fiber-optic connection with 21.2% of businesses using it. Fixed wireless (8.8%) was the next most chosen type of internet service for businesses, while 4.4% of businesses used cell phones or cellular (personal hotspot). About 11.5% reported not knowing what internet service they used.

Figure 46: Business Internet Service by Type (%)

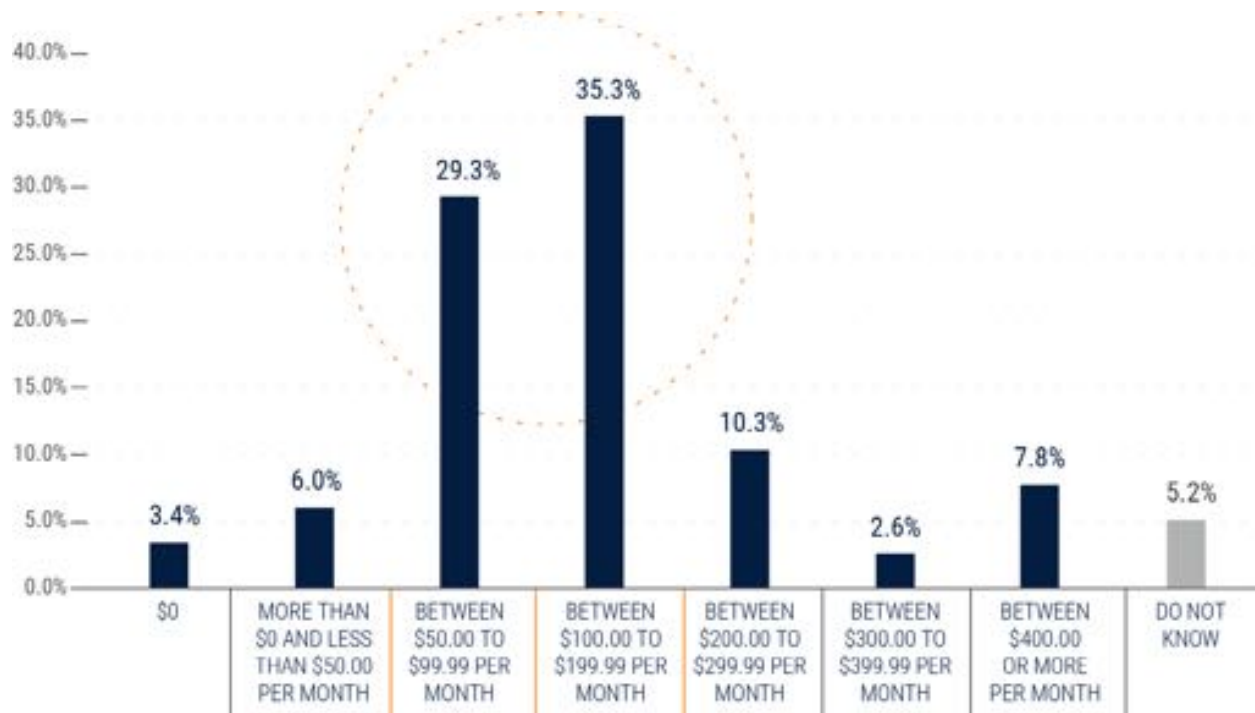


Source: Hunt Institute for broadband survey results.

Internet Cost

Over one-third of businesses reported paying between \$100.00 and \$199.99 per month (35.3%) and nearly a third paid between \$50.00 and \$99.99 per month (29.3%) for their internet service. Businesses paying between \$200.00 and \$299.99 per month made up 10.3% of respondents, and those paying \$400.00 or more per month accounted for 7.8%. About 5.2% reported not knowing what they paid per month.

Figure 47: Amount Paid for Internet Service per Month (%)

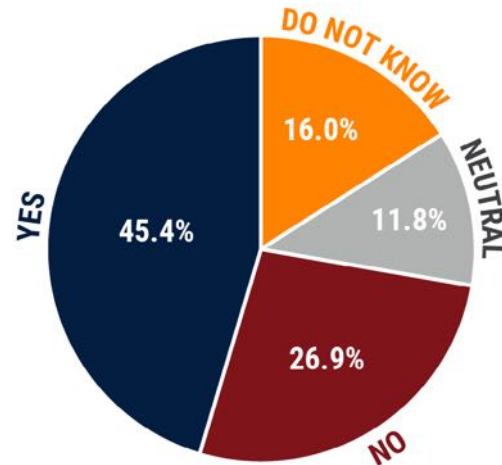


Source: Hunt Institute for broadband survey results.

Customer Service Quality Evaluation

Almost half (45.4%) of businesses reported approving of El Paso County, or one of its partners, offering internet services, even if they compete with private sector companies. About a quarter (26.9%) disapproved of such a proposal, while 16.0% said they do not know, and 11.8% were neutral.

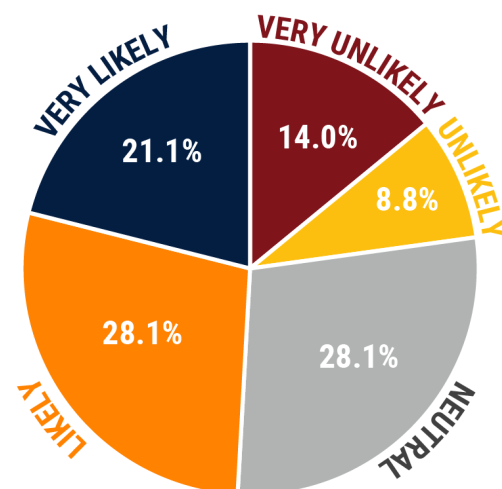
Figure 48: Business Approval of El Paso County Providing Internet Services (%)



Note: Results are based on the opinions of the respondents.
Source: Hunt Institute broadband survey results.

Nearly half of businesses reported that they would likely (28.1%) or very likely (21.1%) utilize El Paso County as an internet service provider. Over a quarter (28.1%) were neutral, while 14.0% were very unlikely and 8.8% were unlikely.

Figure 49: Likelihood of Utilizing El Paso County as an Internet Service Provider (%)

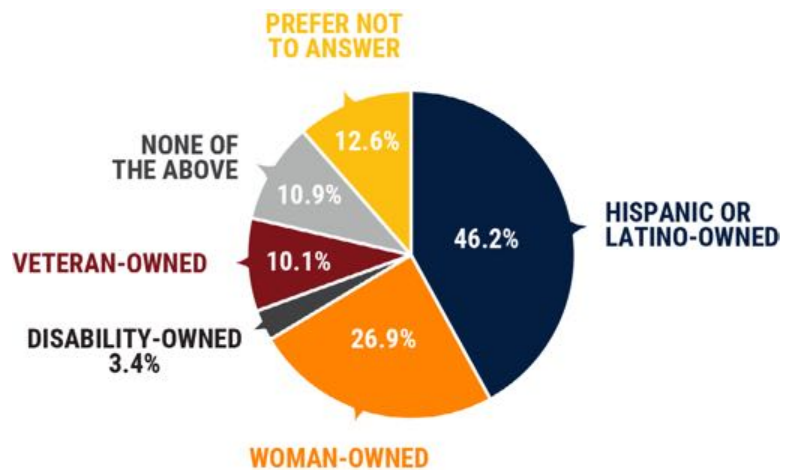


Note: Likelihood is based on the assumption of El Paso County being able to provide reliable, high-speed internet services.
Source: Hunt Institute broadband survey results.

Respondent Ethnicity and Sex

More than half (46.2%) of businesses identified as Hispanic or Latino-owned, over a fourth (26.9%) identified as woman-owned, and 10.1% identified as veteran-owned. Roughly one-fifth of the respondents selected none of the above (10.9%) or preferred not to answer (12.6%).

Figure 50: Business Ownership Identity (%)

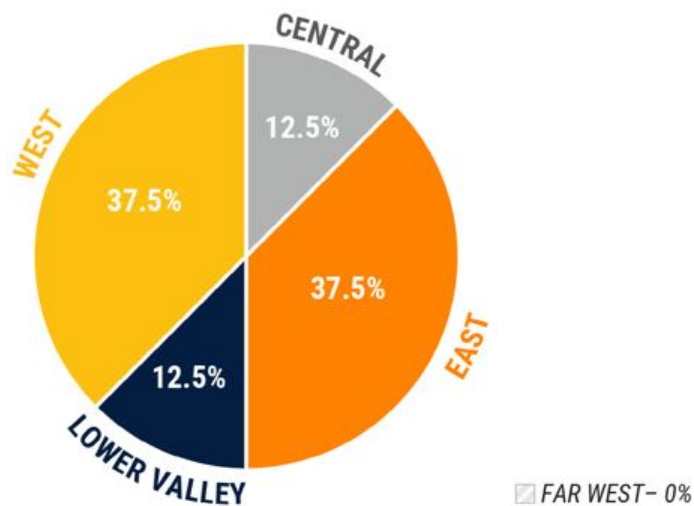


Note: Respondents were directed to select all that apply, thus, percentages will not sum up to 100.

Source: Hunt Institute broadband survey results.

Half of businesses that reported having no internet connection are located in the eastern regions of El Paso County with 37.5% in the East region and 12.5% in the Lower Valley region. About 37.5% of businesses without internet connections are within the West region. The remaining respondents that answered having no internet (12.5%) are in the Central region.

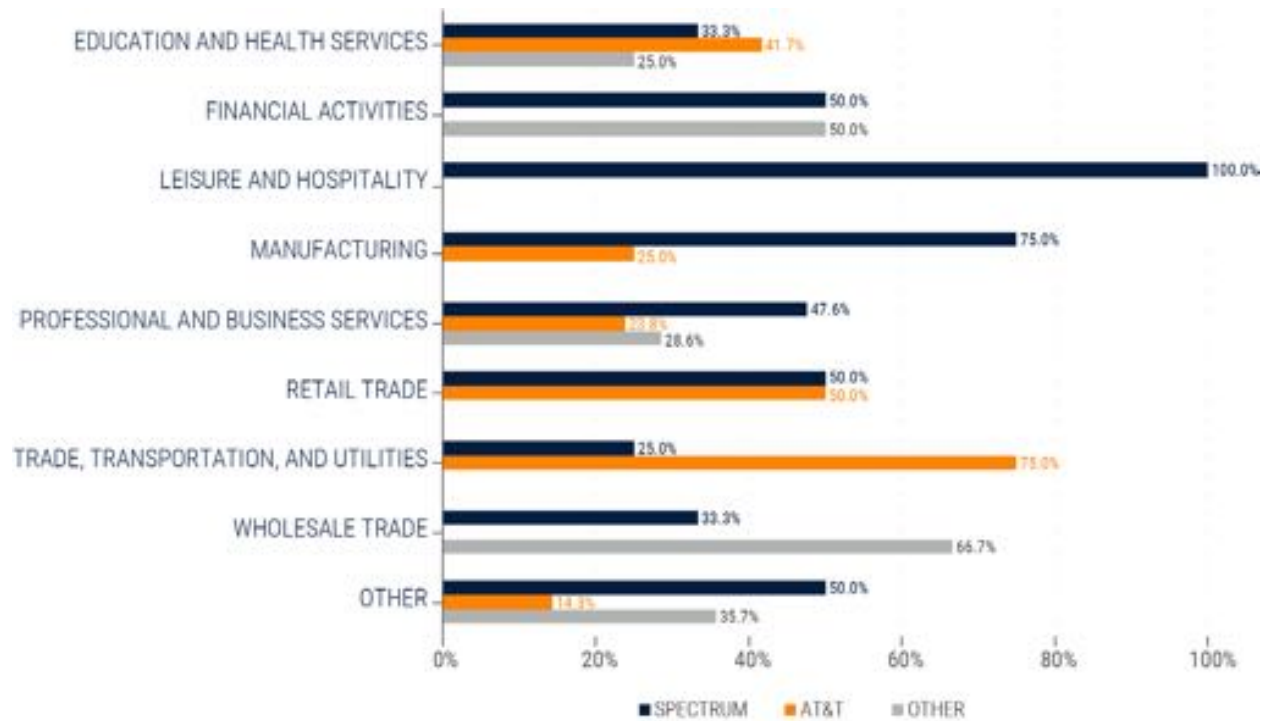
Figure 51: Businesses without Internet by Region (%)



Source: Hunt Institute broadband survey results.

The majority of business sectors have Spectrum as a main provider (leisure and hospitality, manufacturing, professional and business services sectors, and financial activities). AT&T is the primary carrier in the education and health services sector (41.7%), and in the trade, transportation, utilities sector (75.0%). While Spectrum and AT&T share equal participation for the retail trade sector, other providers account for 66.7% participation in the wholesale trade sector.

Figure 52: Main Internet Provider for Business Computers, Laptops, Tablets, and TVs by Sector (%)



Note: Other provider includes T-Mobile, Verizon, Metro by T-Mobile, Sprint, Viasat, West Central Net, Vivint, JackRabbit, HughesNet, Boost Mobile, and others not denoted.

Source: Hunt Institute broadband survey results.

More than half of businesses reported using the internet for communication purposes in both September 2019 (61.8%) and September 2020 (61.1%). Research and analysis were done via internet by 43.1% of businesses in September 2019 and 43.8% in September 2020. Businesses using the internet for marketing and advertising increased from 30.6% in September 2019 to 31.9% in September 2020. Similarly, businesses using the internet for e-commerce increased from 29.9% in September 2019 to 31.9% in September 2020.

Figure 53: Business Internet Uses by Activity, September 2019 vs. September 2020 (%)



Note: Respondents were directed to select all that apply. Percentages reflect whether businesses use the internet for each task, not the frequency or amount of time spent per task.

Source: Hunt Institute broadband survey results.

Some businesses reported revenue increases between September 2019 and September 2020. Only those businesses with higher revenue than \$200,000 in 2019 and between \$15,000 and \$50,000 had an increase in revenue. About 21.2% of businesses reported revenue between \$200,001 and \$500,000 in 2020, an increase in share from the 18.8% of businesses that reported revenue in this range in 2019. Businesses with revenue of more than \$500,000 in 2020 accounted for 31.0% of respondents, an increase of 0.6 percentage points compared to 2019 (30.4%). Businesses reporting revenue between \$50,001 and \$125,000 dropped to 14.2% in 2020 from the 17.0% accounted for in 2019.

Figure 54: Total Business Revenue, 2019 vs. 2020 (%)

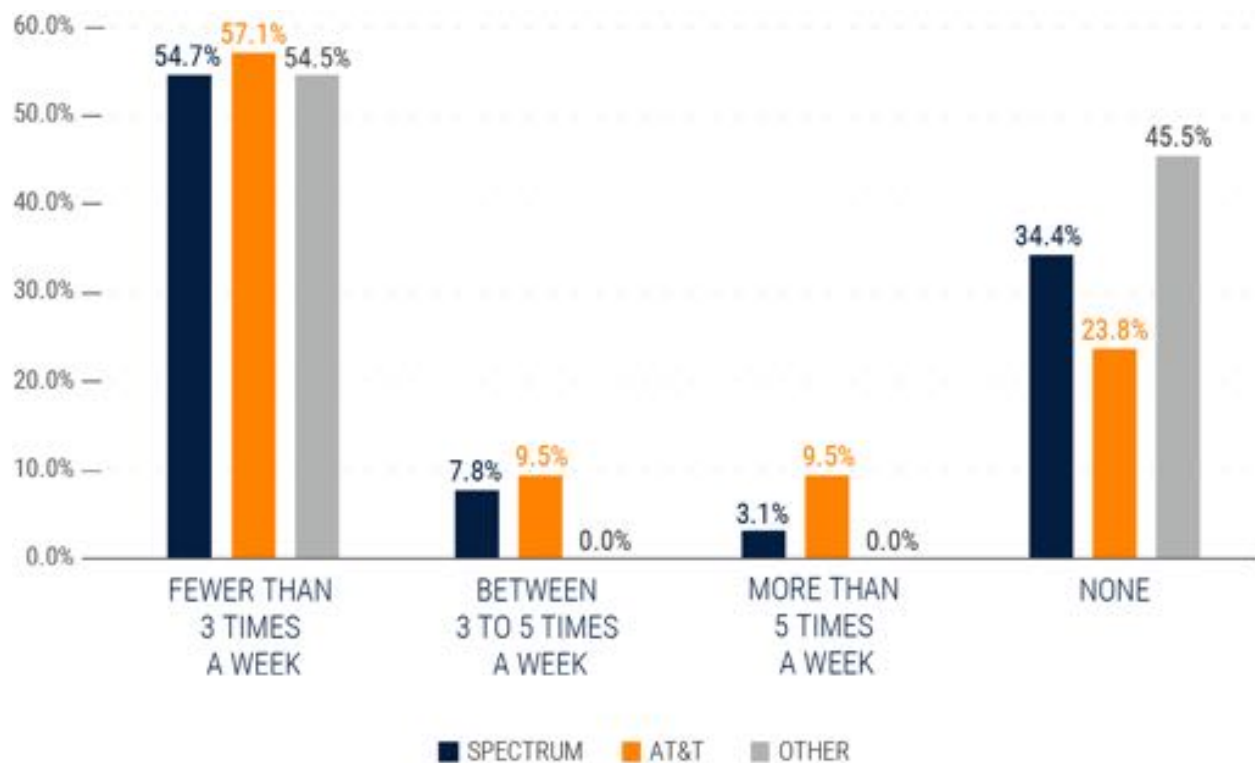


Note: Total revenue (sales) not including financial assistance or loans.

Source: Hunt Institute broadband survey results.

The majority of businesses experience internet outages of less than three times a week when using Spectrum (54.7%), AT&T (57.1%), and other providers (54.5%). About 7.8% and 9.5% of businesses utilizing Spectrum and AT&T experienced outages from three to five times a week. For more than five times a week, 9.5% of businesses being provided access to internet by AT&T and 3.1% by Spectrum. There were about 34.4% of businesses using Spectrum, 23.8% of businesses using AT&T, and 45.5% of businesses using another carrier that experienced no outages on a weekly basis.

Figure 55: Frequency of Internet Outages a Week per Carrier

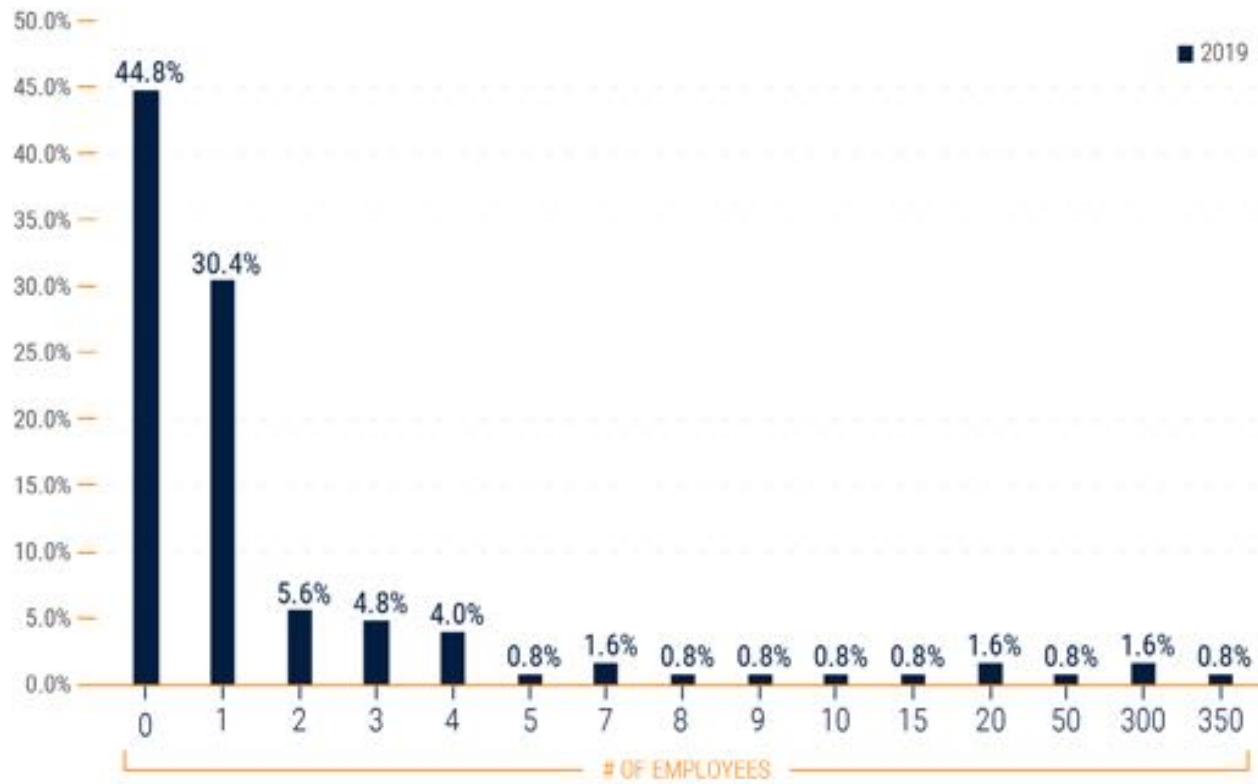


Note: Outages were reported by observations from the respondents.

Source: Hunt Institute broadband survey results.

In September 2019, 44.8% of businesses had no employees working remotely. That same month, 30.4% of businesses only had one remote worker and 5.6% had two, 4.8% had three, and 4% had four. A smaller portion (1.6%) of businesses had 20 remote workers; 0.8% of businesses had 350 employees working remotely.

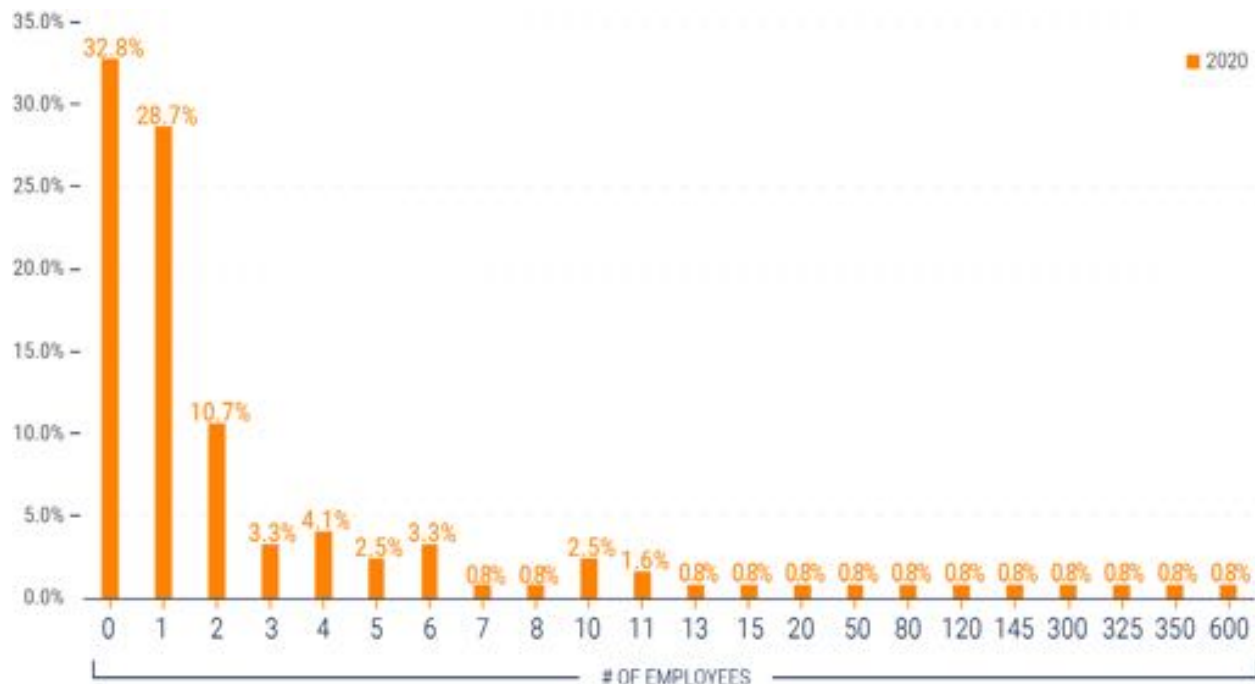
Figure 56: Remote Employees in Business Working from Home per El Paso County, September 2019 (%)



Source: Hunt Institute broadband survey results.

For September of 2020, 32.8% of businesses had no employees working from home. In that same month there were 28.7% of businesses with one employee working remotely and 10.7% with two employees working remotely. About 2.5% of businesses had ten employees working from home. By a large contrast, a small number of businesses had between 80 (0.8%) and 600 (0.8%) employees working remotely.

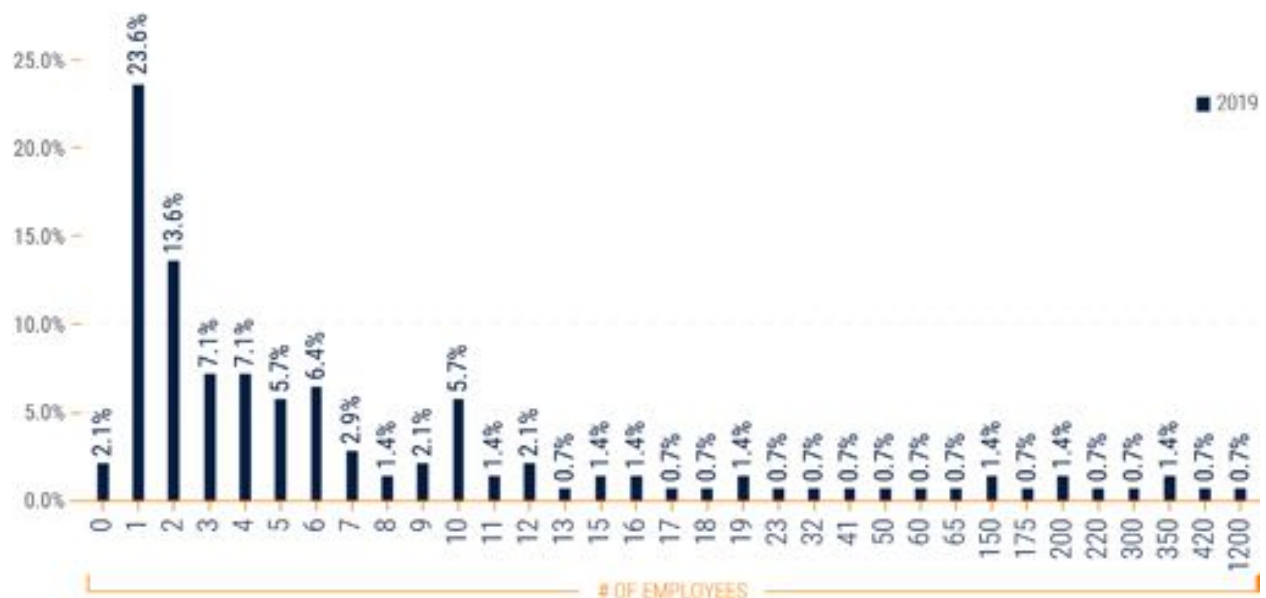
Figure 57: Remote Employees in Business Working from Home per El Paso County, September 2020 (%)



Source: Hunt Institute broadband survey results.

Figure 58 shows that in September 2019 23.6% of businesses had one employee. About 13.6% of businesses had two employees. In the same month, 5.7% of businesses reported ten employees. There were 1.4% of businesses with 350 employees, 0.7% with 420 employees, and 0.7% with 1,200 employees.

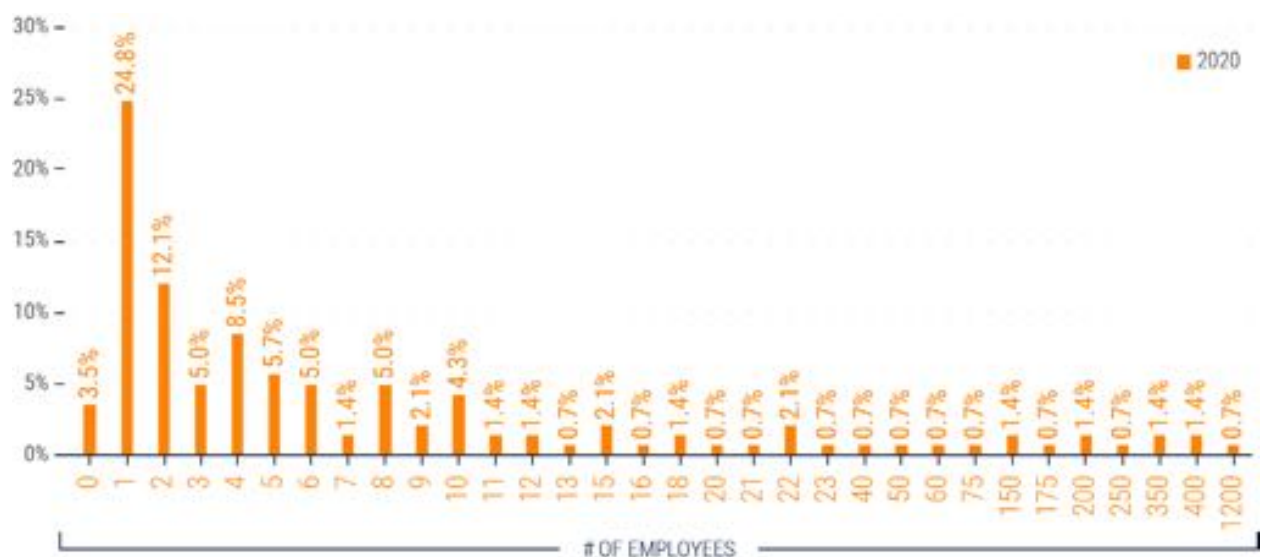
Figure 58: Number of Employees per Business, September 2019 (%)



Source: Hunt Institute broadband survey results.

In September 2020, 3.5% of businesses had one employee. For the same period, 24.8% of businesses had one employee and 12.1% had two. There were ten employees for 4.3% of businesses and 1,200 employees for 0.7% of businesses.

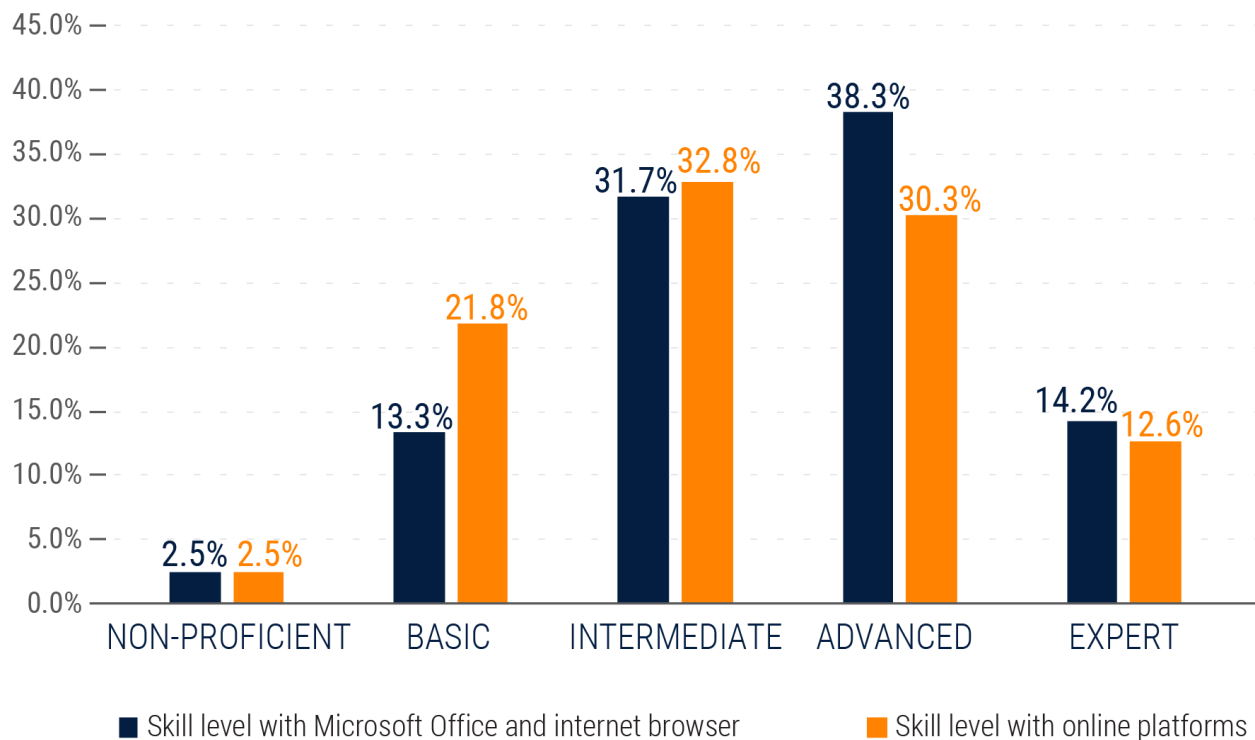
Figure 59: Number of Employees per Business, September 2020 (%)



Source: Hunt Institute broadband survey results.

About 2.5% of businesses reported nonproficient use with Microsoft Office and 2.5% also said nonproficiency in employee skill level for online platforms. Also, 13.3% reported their employees had a basic skill level with Microsoft Office and 21.8% reported a basic skill for online platforms. In contrast, 14.2% of businesses reported an expert skill level from their employees with Microsoft Office and 12.6% with online platform skills.

Figure 60: Employee Skill Level with Microsoft Office & Internet Browsing and Employee Skill Level with Online Platforms (%)

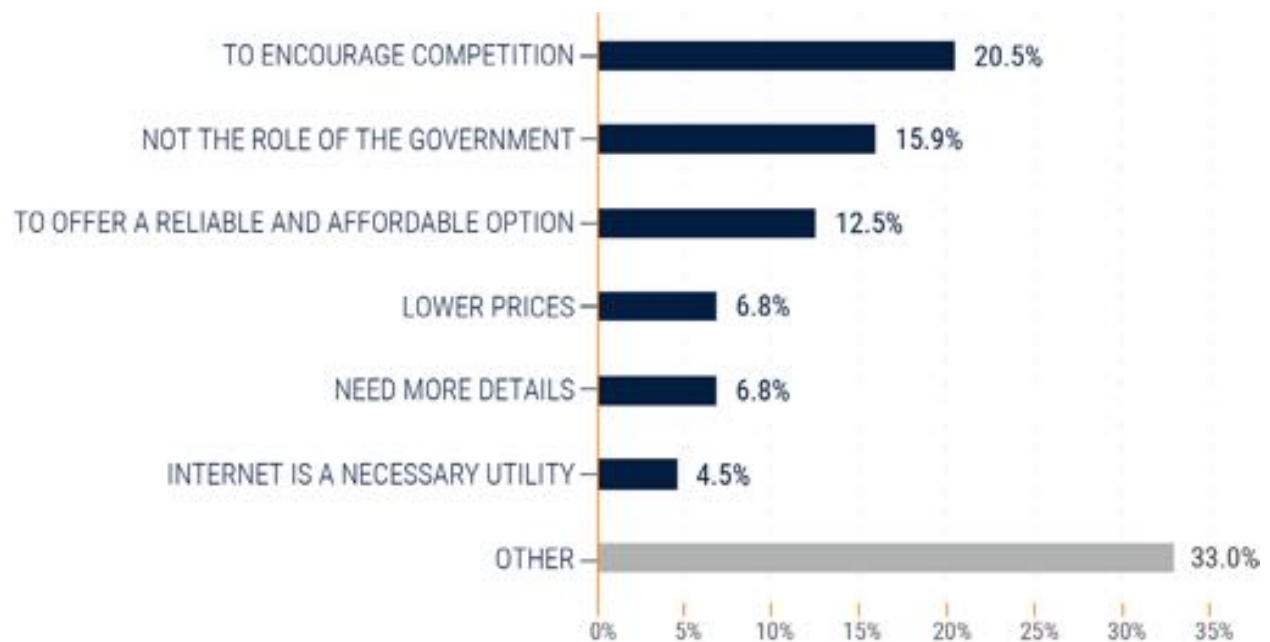


Note: Results are based on the opinions of the respondents.

Source: Hunt Institute for broadband survey results.

Of the businesses that provided their opinion toward El Paso County or a partner offering internet services, nearly one fourth (20.5%) believed it would encourage competition for internet services. An additional 12.5% believed El Paso County could help to offer a reliable and affordable option and 6.8% responded it could lower prices. However, 15.9% believe it's not the role of government and 4.5% said the internet is not a necessary utility. Roughly 6.8% need more details to make a decision. The remaining respondents (33%) offered varying opinions.

Figure 61: Disposition Towards El Paso County or a Partner Offering Internet Services (%)



Source: Hunt Institute broadband survey results.

Findings from Business Focus Groups

Business Study Focus Group Summary

A focus group session with five businesses was conducted by the Hunt Institute. The purpose of this focus group was to understand the relationship between business and their internet service providers in El Paso County. Ten questions were asked related to broadband service needs following COVID-19.

Participant Occupation and Primary Use for Internet

- **Participant #1** works for a third-party logistics company near the Zaragoza bridge that uses internet to manage import-export services. The company has significantly increased internet usage since the pandemic, but because of poor broadband quality service, the company contracted multiple internet service providers to address some of their internet issues. This increased their internet costs significantly. This cost has been absorbed completely by the company.
- **Participants #2 and #3** represent Fortune 500 Companies that use the internet in support of U.S.-Mexico Customs compliance operations between their manufacturing plants in Ciudad Juárez and their warehousing and distribution centers established in the County of El Paso. These companies reported teleworking before the pandemic began, therefore, no significant adjustments needed to be made. These participants reported that they experience network instability on average of once a month or sometimes twice a month.
- **Participant #4** is a micro-business owner operating a graphic design company from home. The participant expressed negative broadband issues, especially during the beginning of the pandemic, due to other family members teleworking from home. The owner of the small business needed to add a Wi-Fi booster to extend the wireless internet signal to support telework and the regular household internet needs.
- **Participant #5** works for a major El Paso utility provider. The participant reported broadband issues due to the increased use of the internet by family members at the same time for telework and remote education. The family considered upgrading their internet service package for higher internet speed but did not do it because it is very costly. Household members also had intermittent internet connectivity. A hotspot was added to boost the internet signal to all household members during the beginning of the pandemic. This participant recommended that internet providers notify users when there are internet service outages within a region.

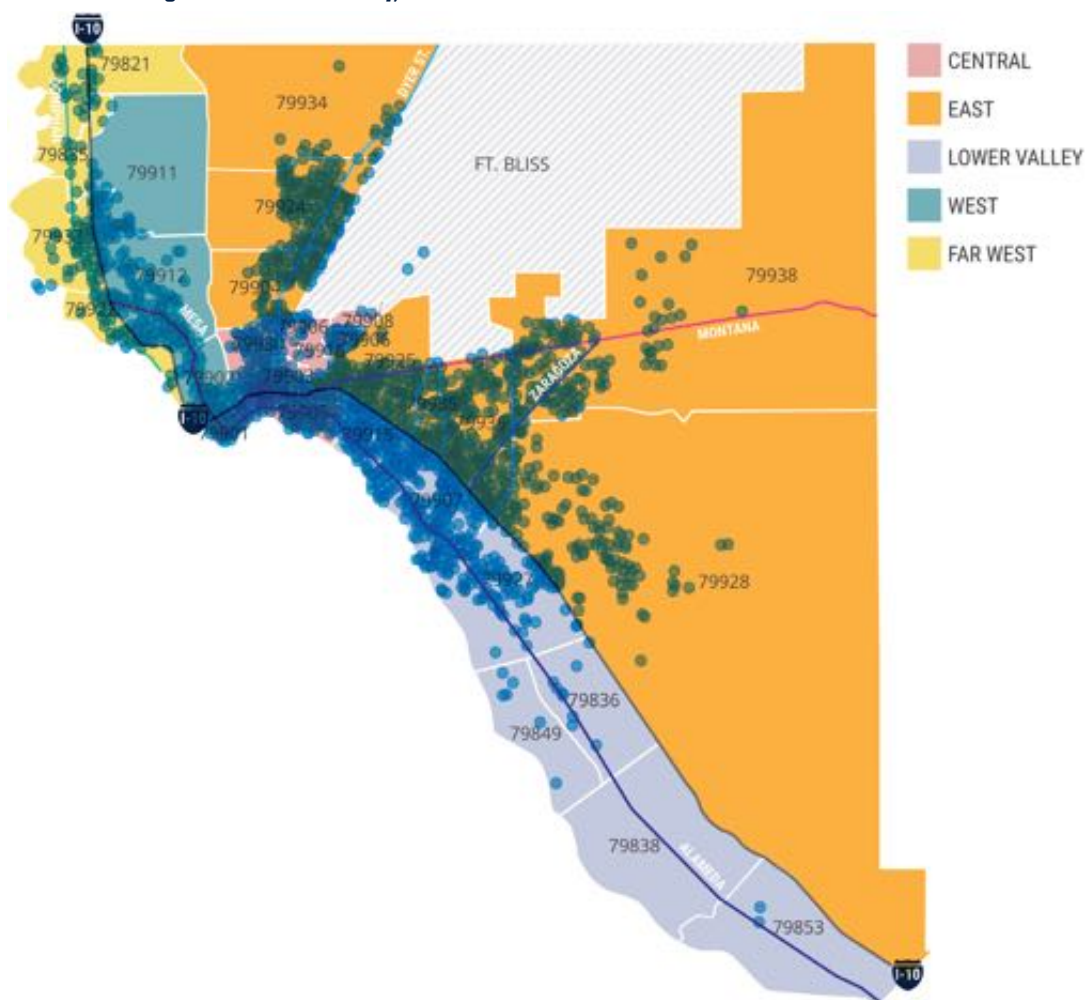
Key Takeaways

- The primary use of internet among the business focus group respondents was for communication and processing of operations.
- The public health measures taken to reduce transmission of COVID-19 caused higher demand for high-speed, high-quality internet from household members working and studying remotely.
- Recommendations by the production-sharing company were to have internet service providing a backup when internet outages occur, considering the consequences for manufacturing and distribution centers linked to just-in-time supply chains.
- It was also recommended by the production-sharing company participants to have internet providers notify users of the estimated time to fix internet outages while also informing customers what the cause of the issue was once it is fixed.
- The pandemic increased internet usage for most of these participants. This caused them to incur additional costs to expand the internet speed, fix internet issues, or support.
- High-speed internet consistency is key to supporting large commercial businesses and micro-entrepreneurs.
- All participants reported experiencing internet interruptions regardless of their internet speed.
- Two business participants experienced internet problems such as intermittent connectivity and low bandwidth, especially during the beginning of the pandemic.
- Three out of five participating businesses had to make internet adjustments to have a reliable internet connection that would support their day-to-day internet operations.
- The average internet peak usage ranges between 9:00 am to 4:00 pm, Tuesdays to Thursdays.
- Going forward, internet dependency is expected to increase as a result of the COVID-19 pandemic.

Broadband Mapping

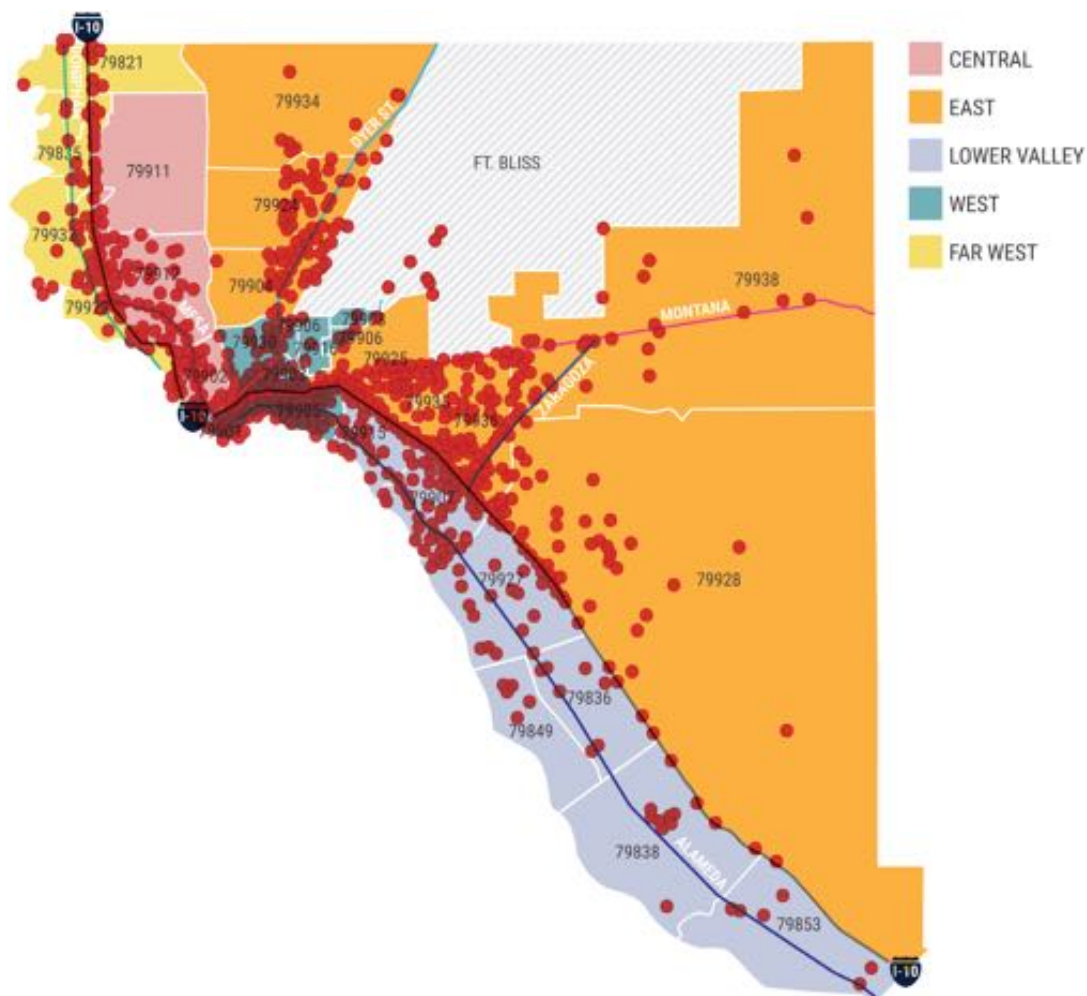
Connected Buildings are a new form of intelligent technology where disparate building systems are connected through a single operating system. Connected Buildings drive smart efficiency with automated systems, including sensors for lighting, heating, ventilation and air conditioning (HVAC) systems, and security systems. Connected Buildings technology also promotes and enables data-driven decisions that can be used to increase efficiency and cut costs. Maximum and cost-efficient performance is supported with the appropriate physical infrastructure, which depends on how the Connected Building is being used. Some examples include fiber and copper cabling, and point-to-point antennas. Map 2 shows that the distribution of Connected Buildings is mainly clustered around the center of El Paso County and expands to the rest of the regions. The distribution of Connected Buildings is less present going further east towards the East and Lower Valley regions.

Map 2: Connected Buildings across El Paso County, Texas



Cell towers are a type of communications infrastructure. Cell towers are where electronic communications equipment and antenna are equipped, which supports cellular communication through a network. These cell towers send and receive signals to and from cell phones. In addition, they play a large role in the future of wireless networks, as they continue to be the most reliable method to deliver wireless coverage. This includes delivering wireless broadband coverage, which in some rural areas is the only source for wireless broadband access. Deployment of such wireless access to these rural areas, therefore, has the potential to provide the same broadband benefits as the rest of the nation. Map 3 shows the distribution of all cell towers located across El Paso County. As shown in Map 3, cell towers are conglomerated all along of I-10 interstate. Cell towers corridors are also identified along Doniphan Street, North Mesa Street in the West region, around the Central region, and along Dyer Street, Montana Avenue, Lee Trevino, and Zaragoza in the East region, and along Alameda Avenue in the Lower Valley region. Cell towers are located sparsely going further east in the East and Lower Valley regions.

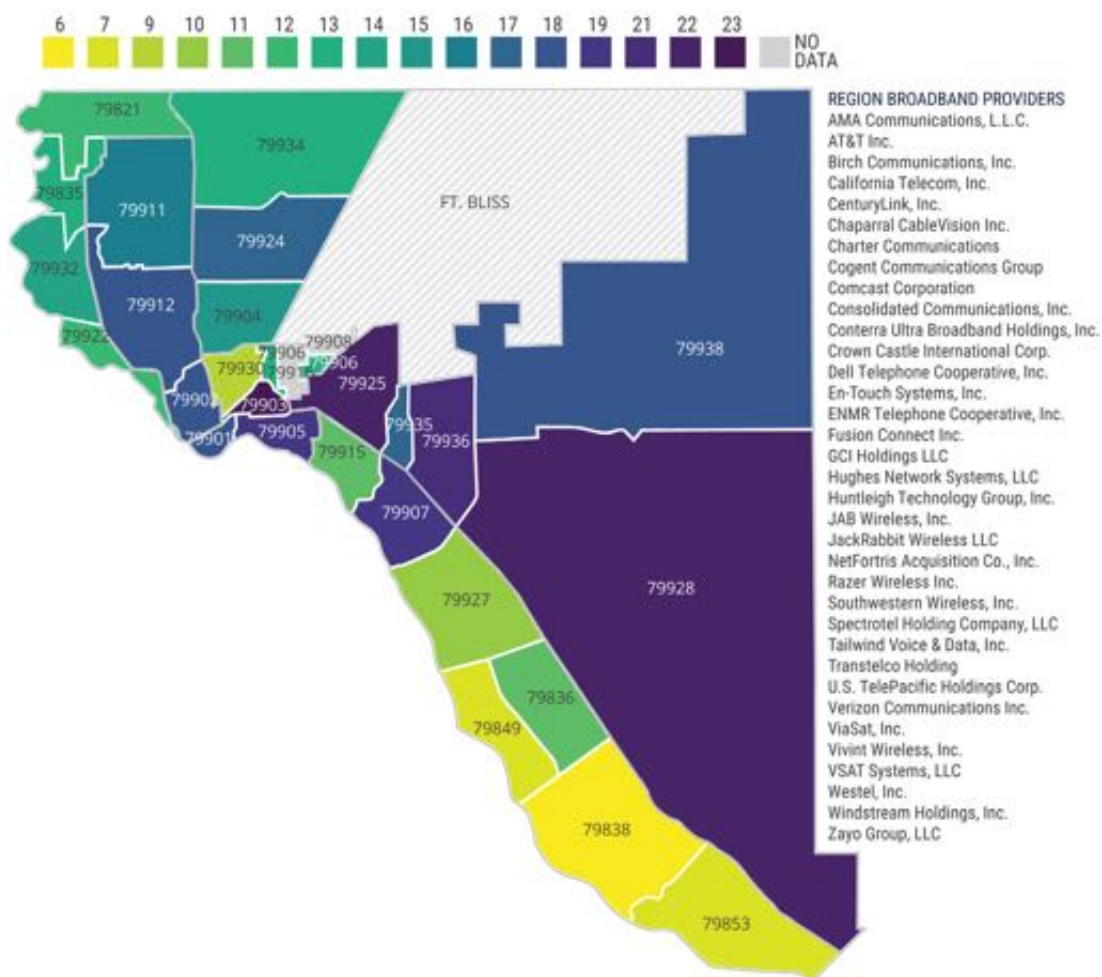
Map 3: Distribution of Cell Towers in El Paso County, Texas



Source: Hunt Institute using FiberLocator.

As of June 30, 2020, the Federal Communications Commission (FCC) released Form 477 data on Broadband Deployment across the U.S. The FCC requires fixed broadband providers to submit data on information of services available from fixed broadband technologies through Form 477 twice a year.⁷ Form 477 data is reported at the census block level; fixed broadband providers submit lists of census blocks in which they can or do offer service to at least one location. These data are available to the public and free for download through the FCC website. The Hunt Institute downloaded these data for El Paso County, Texas, to provide information on the names of all fixed broadband service providers and for determining the total number of service providers in each region, as can be shown in Map 4.

Map 4: Number of Service Providers by Region in El Paso County, Texas



Note: Regions that share the same color code do not necessarily share the same service providers. Spectrum brand is used by its parent company Charter Communications.

Source: Hunt Institute using FCC Form 477 Data as of December 31, 2020, the latest data available.

⁷ The FCC also releases data on Mobile Broadband Deployment through Form 477 as of December 31, 2015. For this report, The Hunt Institute only considered the Form 477 Fixed Broadband Deployment Data, therefore, service providers that only provide fixed wireless technology services, such as T-Mobile, are not shown in this analysis.

Table 5 and Table 6 provide summary statistics of residential median download and upload speeds by region, which were derived from household survey responses regarding their internet service speeds. Survey respondents' median download speed was lowest for households living in the East region (49.15 Mbps) and the Lower Valley region (70 Mbps). The Lower Valley region also reported the lowest average for the top and bottom quintiles of download speeds for households across all county regions with 303.3 Mbps and 3.01 Mbps, respectively.

In the case of household survey respondents' upload speeds, the Lower Valley region recorded the lowest median speed (10.81 Mbps), the lowest average for the bottom quintile (0.57 Mbps), and the second lowest for the average of the top quintile (110.31 Mbps) across all El Paso County regions. Having recorded the lowest median download speed, as well as registering the lowest speeds for the average download and upload speeds bottom quintiles for households, the Lower Valley region is an underserved area to focus efforts to increase accessible and reliable broadband internet speed in El Paso County.

Table 5: Household Download Speeds by El Paso County Region, Mbps

REGION	AVERAGE OF BOTTOM QUINTILE	AVERAGE OF TOP QUINTILE	MEDIAN
CENTRAL	10.81	552.72	112.70
EAST	11.00	368.81	49.15
LOWER VALLEY	3.01	303.30	70.00
WEST	14.88	509.35	105.36
FAR WEST	15.42	359.30	102.40
EL PASO COUNTY	11.61	412.94	77.74

Source: Hunt Institute using survey results.

Table 6: Household Upload Speeds by El Paso County Region, Mbps

REGION	AVERAGE OF BOTTOM QUINTILE	AVERAGE OF TOP QUINTILE	MEDIAN
CENTRAL	2.11	222.90	12.93
EAST	1.67	106.31	11.23
LOWER VALLEY	0.57	110.31	10.81
WEST	4.61	270.38	18.80
FAR WEST	3.38	124.55	11.49
EL PASO COUNTY	2.21	159.20	11.59

Source: Hunt Institute using survey results.

Table 7 and Table 8 provide the average of the bottom speed quintile and the average of the top speed quintile for download and upload speed, respectively, as well as the overall median speed for El Paso County businesses. Both the download (91.45 Mbps) and upload (11.77 Mbps) median speeds for businesses were higher than the download (77.74 Mbps) and upload (11.59 Mbps) median speeds for households, respectively. This was also true for the average of the bottom and top speeds by quintile for El Paso County.

Table 7: Summary Statistics of Businesses Download Speeds by Region, Mbps

REGION	AVERAGE OF BOTTOM QUINTILE	AVERAGE OF TOP QUINTILE	MEDIAN
EL PASO COUNTY	15.56	439.83	91.45

Source: Hunt Institute using survey results.

Table 8: Summary Statistics of Businesses Upload Speeds by Region, Mbps

REGION	AVERAGE OF BOTTOM QUINTILE	AVERAGE OF TOP QUINTILE	MEDIAN
EL PASO COUNTY	3.74	207.22	11.77

Source: Hunt Institute using survey results.

Economic Impact Study

Introduction

The Hunt Institute estimated the potential economic impact of broadband expansion in El Paso County, Texas, using the Impact Analysis for Planning (IMPLAN) software. The analysis considers the economic impact of the proposed expansion of broadband internet services detailed in the “Broadband Expansion Business Plan” composed by the Mike Loya Center for Innovation and Commerce (2021). The study pays specific attention to the impact of this expansion program on total employment, labor income, value added, and output over the 17-year period ranging from 2022 to 2040. This study also identifies the ten industries that would be most impacted by the proposed broadband expansion.

Researchers and policymakers frequently use IMPLAN software to determine the economic impact of various spending shocks. While these spending shocks may be isolated to a specific industry, such as broadband infrastructure, the inclusion of intersectoral linkages and economic multipliers within the IMPLAN software allows the impact of such spending shocks to spread through the regional economy. The impact is estimated sector-by-sector, which allows for the total effect to be decomposed into direct, indirect, and induced effects. In the present context, direct effects refer to the employment and income supported by the initial spending in broadband infrastructure, while indirect effects are the employment and income generated as second-round spending or as purchases of goods and services from suppliers. Finally, induced effects capture gains to employment and income due to increased support activities, such as retail, restaurants, and hospitality, following the broadband expansion.

While the intersectoral linkages and economic multipliers within the IMPLAN software allow users to analyze the impact of spending shocks on multiple sectors within the regional economy, there are still some limitations to the analysis. Most important for the present application is that IMPLAN is unable to update or alter the stock of broadband infrastructure throughout the analysis. Because of this limitation this economic impact study only measures the impact of additional spending related to the development and connection of new broadband infrastructure, as well as the revenue generated by new services that internet service providers will offer going forward. But the present analysis is unable to capture the spillover benefits that will arise due to greater connectivity in the region (e.g., attracting new investment from the private sector). The results presented below serve then as a lower bound on the economic impact associated with expanding broadband infrastructure in El Paso County.

Methodology

An economic impact study of expanding broadband infrastructure in El Paso requires an estimate of the costs associated with the proposed project. The Hunt Institute used the Loya Center's "Broadband Expansion Business Plan" for these cost estimates. This business plan provides details regarding the proposed expansion, including the number of miles of broadband infrastructure constructed, the average cost per mile, the number of premises that will be connected, and the average cost to connect each premises. Below, we provide a brief overview of the expansion business plan and detail the estimates that serve as inputs into our economic impact analysis.

The expansion business plan begins by considering which zip codes within El Paso County are most in need of broadband infrastructure expansion. The plan identifies two zip codes, 79930 and 79838, as ideal candidates for expansion as they both possess many unserved premises, are rated low in terms of internet coverage, and servicing these areas would require the construction of a relatively small amount of additional broadband infrastructure. In total, developing these two zip codes would require the construction of approximately 236 miles of new broadband infrastructure and would add service to approximately 20,000 premises.

The cost of expanding broadband infrastructure can be broken into two main components: passing costs and drop costs. Passing costs are the costs associated with building out the network so that both residential and commercial buildings have access. The expansion business plan estimates that each mile of broadband infrastructure will cost approximately \$90,000. As such, the network construction costs will total \$21,240,000. With 20,000 premises serviced, this results in an average passing cost of \$1,062.

Drop costs refer to the costs associated with connecting premises to the network. The expansion business plan estimates an average drop cost of \$756. The total drop costs for 20,000 premises is \$15,120,000. Combining passing and drop costs yield the total cost of the expansion of \$36,360,000. Also, the new services provided in the expansion areas will generate additional spending, which must also be considered.

Incorporating the cost structure outlined above into IMPLAN requires assumptions on how costs evolve over time. The Hunt Institute assumed that construction of the network (the passing costs) would take three years, with equal costs each year. Each of the first three years of the project requires passing cost expenditures of \$7,080,000. Once construction is completed, drop costs begin to accrue as premises are connected to the network. The Hunt Institute assumes that 20% of premises are connected each year, which implies that it will take five years, at an average drop cost of \$3,024,000 per year, to connect all 20,000 premises. These costs must also be allocated between expenditures on equipment, materials, and labor. The expansion business plan estimates that drop costs are approximately 18.5% equipment, 25.9% materials, and 55.6% labor. The Hunt Institute adopted this breakdown for both

passing and drop costs used within our analysis. Finally, once a premises is connected to the network additional revenue will be generated through the provision of new services. This flow of service payments is assumed to begins once premises are connected and is assumed to continues through 2040.

Results

Using the data described above, we conduct our economic impact analysis year-by-year over the 2022-2040 time period. As previously noted, the first three years (2022-2024) is when the new construction occurs, and the following five years (2025-2029) is when premises are connected to the new system. Revenue from new services provided also begin as premises are connected and the flow of revenue from the 20,000 newly connected premises continues until the terminal year (2040).

Table 9 presents the total effect of the expansion project aggregated over all seventeen years of the analysis. Inspection of Table 9 shows that the total effect of the expansion project on output for El Paso is \$73,709,661. Given that the total cost of the project is assumed to be \$36,360,000, this represents a two-fold increase. It is important to keep in mind that this estimate is best interpreted as a lower bound of the total impact of the expansion project as the IMPLAN software is unable to account for additional investments from the private sector that may flow into the region following the broadband expansion.

Further inspection of Table 9 reveals the direct effect on output is \$47,533,537, while the indirect and induced effects are \$15,862,824 and \$10,313,301, respectively. As such, over 64% of the total is driven by the employment and income supported by the initial spending in broadband infrastructure.

Table 9 also presents the impact in terms of employment, labor income, and value added. The total effect on employment is an additional 392 jobs within the region, while labor income to increase by \$17,935,830. Value added is also expected to rise by \$32,744,216. The decomposition across direct, indirect, and induced effects is similar to that discussed for output, with the direct effect accounting for a majority of the increase in employment, labor income, and value added.

Table 9: Aggregate Effect of Proposed Broadband Expansion, 2022-2040

IMPACT TYPE	EMPLOYMENT	LABOR INCOME	VALUE ADDED	OUTPUT
DIRECT EFFECT	231	\$11,152,496	\$20,657,471	\$47,533,537
INDIRECT EFFECT	84	\$3,809,253	\$6,745,808	\$15,862,824
INDUCED EFFECT	77	\$2,974,081	\$5,340,938	\$10,313,301
TOTAL EFFECT	392	\$17,935,830	\$32,744,216	\$73,709,661

Source: IMPLAN and Hunt Institute.

The previous results consider the total impact of the proposed expansion in aggregate. However, as discussed above, the analysis was conducted year-by-year, and as such, it is possible to breakdown the economic impact of the expansion across various phases of the project. Table 10 provides the total effect of the expansion project by year on employment, labor income, value added, and output. The effects in the first three years (2022-2024) are the largest because this is the bulk of the initial construction expenses occur here. The effects drop during Years Three through Eight (2025-2029) when premises are connected to the system and new services are being offered. The final phase, which aggregates all other years (2030-2040), accounts for the impact of new services provided to previously unserved premises.

Table 10: Total Effect of Proposed Broadband Expansion by Year

YEAR	EMPLOYMENT	LABOR INCOME	VALUE ADDED	OUTPUT
Year 1 (2022)	65	\$2,887,423	\$4,724,708	\$10,919,290
Year 2 (2023)	64	\$2,843,301	\$4,655,329	\$10,771,049
Year 3 (2024)	63	\$2,799,960	\$4,587,158	\$10,625,290
Year 4 (2025)	28	\$1,230,876	\$2,069,699	\$4,768,882
Year 5 (2026)	28	\$1,265,627	\$2,179,245	\$4,997,611
Year 6 (2027)	29	\$1,300,166	\$2,287,900	\$5,224,450
Year 7 (2028)	29	\$1,334,492	\$2,395,664	\$5,449,400
Year 8 (2029)	32	\$1,493,420	\$2,569,334	\$5,684,529
All Others (2030 - 2040)	55	\$2,780,564	\$7,275,179	\$15,269,160

Source: IMPLAN and Hunt Institute.

While Tables 9 and 10 provide an overview of the aggregate impact of the proposed expansion, both at a single point in time and year-by-year over the duration of the project, we are also interested in the sector-specific impact of the expansion. To this end, Table 11 presents the top ten sectors most impacted by broadband expansion in terms of employment, labor, income, value added, and output over all years. These top ten industries are common across each of the four variables, though their specific ordering may change by variable. Interestingly, the top five most impacted industries—construction of new power and communication structures, wired telecommunications carriers, other communications equipment manufacturing, broadcast and other communication equipment manufacturing, construction of new educational and vocational structures—are consistent across all four variables.

Other sectors in the top 10 include employment services, full-service restaurants, management of companies and enterprises, other real estate, and limited-service restaurants.

Table 11: Top Ten Most Impacted Industries, 2022-2040

SECTOR	DESCRIPTION	EMPLOYMENT	LABOR INCOME	VALUE ADDED	OUTPUT
52	CONSTRUCTION OF NEW POWER AND COMMUNICATION STRUCTURES	147	\$6,196,591	\$8,752,438	\$17,401,897
433	WIRED TELECOMMUNICATIONS CARRIERS	32	\$2,097,760	\$6,722,516	\$13,434,131
303	OTHER COMMUNICATIONS EQUIPMENT MANUFACTURING	23	\$1,248,922	\$2,667,358	\$9,209,793
302	BROADCAST AND WIRELESS COMMUNICATIONS EQUIPMENT MANUFACTURING	17	\$1,057,346	\$1,991,649	\$6,578,423
53	CONSTRUCTION OF NEW EDUCATIONAL AND VOCATIONAL STRUCTURES	14	\$636,059	\$793,282	\$1,448,406
472	EMPLOYMENT SERVICES	9	\$332,833	\$501,306	#8 \$786,501
509	FULL-SERVICE RESTAURANTS	6	#8 \$129,942	#9 \$182,715	#10 \$363,198
469	MANAGEMENT OF COMPANIES AND ENTERPRISES	6	#7 \$257,754	#7 \$308,173	#7 \$814,120
447	OTHER REAL ESTATE	5	\$118,500	#8 \$264,165	#6 \$913,498
510	LIMITED-SERVICE RESTAURANTS	5	\$97,928	#10 \$150,511	#9 \$374,930

Note: Top ten industries most impacted industries ordered from most to least impacted in terms of employment. Rank changes for labor income, value added, and output are listed in orange text. Sector codes come from IMPLAN.

Source: IMPLAN and Hunt Institute.

Conclusion

Research conducted by the Hunt Institute shows that the broadband internet connection rate for El Paso County is lower than that suggested by FCC data. Only 56.7% and 72.7% of the household and business survey respondents, respectively, reported having broadband services in El Paso County, which is in sharp contrast to the 96.8% figure that would have broadband access as reported by the FCC. By overstating the current level of broadband connectivity in El Paso, the FCC figures may jeopardize the county's ability to attract federal funds that have been allocated to expanding broadband infrastructure throughout the country. The lack of broadband internet access and reliable broadband internet speed was most pronounced in the eastern portions of the county, in particular, in the Lower Valley region.

Two fixed internet providers—AT&T and Spectrum—service the overwhelming majority of both residential and business internet customers in the county. Most household and business survey respondents are satisfied with their internet service; gaps in perceived service quality were observed for businesses who use a provider other than AT&T and Spectrum. Both household and business survey respondents reported service interruptions and indicated there was room for service quality to improve. Respondents also expressed a desire for increased competition in the broadband market through their support of some form of El Paso County involvement in expanding broadband. In particular, 55.8% of household respondents approve of El Paso County, or one of its partners, offering internet services, even if they compete with private sector companies. Nearly as many business respondents (45.4%) expressed support for the same concept.

Gaps in digital literacy were found across regions. While expanding and improving broadband access and reliability are a priority for growth and development opportunities for El Pasoans, efforts to increase digital literacy are supportive of such efforts. Without increased attention on digital literacy, it is unclear the extent to which broadband expansions would be taken up by the community. Therefore, efforts to expand broadband access in the region should be complemented by programs that increase digital literacy so that more El Pasoans have access to broadband internet services and have the skills necessary to use such services effectively.

Expanding the broadband network in El Paso County is a costly undertaking but such efforts also provide many economic benefits. Using the cost estimates provided by the Loya Center, the Hunt Institute estimates that such a broadband expansion would result in a two-fold increase in output within the region, meaning that for every dollar spent on the expansion project, regional output would increase by two dollars. These economic benefits are spread across a 17-year period and are best thought of as a lower bound as the modeling software is unable to account for new private investment that may be flow to the region as a result of the expansion.

In summary, this report identifies gaps in broadband access in El Paso County relative to FCC estimates and provides information on where expansion efforts would be most effective. In order to effectively expand broadband infrastructure and build a more connected future for the region, efforts should focus on underserved areas. The research findings suggest that households and businesses located on the eastside of El Paso County (East region and Lower Valley region) are currently underserved and that customers of smaller providers are less satisfied with their service. Future expansion programs should take a geographic and market-based approach to target efforts to these key underserved areas. Finally, while such expansion programs are costly, the results of the economic impact study suggest that the expansion will have a positive effect on the regional economy.