Broadband Demand: The Cost and Price Elasticity of Broadband Internet Service in Rural Pennsylvania

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Key Findings and Policy Considerations

This year-long research project surveyed rural and urban Pennsylvanians about their willingness to pay for high-speed broadband service. It provides a unique first look into factors that continue to create substantial barriers to closing the digital divide.

The researchers surveyed 1,446 Pennsylvania residents in May and June 2020. They used a hybrid telephone/SMS (short message service, or "text messaging") survey that asked respondents about the type of internet technology available to them, broadband pricing, and willingness to pay for 25 Megabits per second (Mbps) broadband.

Key findings:

1. There are differences in the types of internet service used by urban and rural respondents, with urban respondents reporting higher use of cable and fiber connectivity and rural respondents reporting higher use of dial-up, DSL, and satellite;
2. An evaluation of pricing data alone masks important differences in speed tiers between urban and rural respondents;
3. Within pricing tiers, rural respondents are more likely to have slower internet speeds and urban respondents are more likely to have faster speeds;
4. Urban and rural respondents are receiving systematically inequitable service - not only in terms of broadband speed, but also in price for service;
5. The demand for broadband service shows a "sweet spot" in terms of willingness to pay in the under $60/month range; and,
6. When speed and price are held stable, rural respondents have a higher willingness to pay for broadband than urban residents.

Policy considerations:

1. Change Pennsylvania's current definition of "broadband" – currently defined as 1.544 Mbps download and 128 kilobits per second upload speed – to meet or exceed federal definitions for broadband.
2. Establish government support mechanisms for broadband buildout that provide greater transparency and standardized public disclosure of broadband service characteristics, including speed, regular pricing, and service limitations.
3. Commission a statewide study to assess and derive a broadband affordability formula and model for how much low-income households can afford to spend on broadband without having to sacrifice other necessities such as rent, food, medical care, etc.
4. As suggested in earlier research on broadband availability and access, policymakers should maximize the options for broadband service provision by allowing other viable entities, such as community-based networks, municipalities, and cooperatives, to deploy broadband across rural Pennsylvania.

Executive Summary

The digital divide is a long-standing problem that has disadvantaged far too many already-marginalized constituencies. Over the past several years, interest in more accurately documenting the true state of broadband connectivity has grown dramatically;[1] with the coronavirus pandemic forcing millions of Americans to work and learn from home, the importance of ensuring universal broadband connectivity has never been more salient.[2]

For the past 2 years, Pennsylvania has been at the forefront in developing new broadband mapping resources and pioneering methodologies. These resources, data, and methodologies are currently being adopted by numerous federal agencies, states, and local municipalities. Yet while our understanding of the true state of broadband availability has grown dramatically over the past 2 years, our understanding of one of the key barriers to adoption – price and consumer demand – has languished.

"Broadband Availability and Access in Rural Pennsylvania," a 2019 report published by the Center for Rural Pennsylvania, collected more than 11 million broadband speed tests from across Pennsylvania to measure broadband speeds. Results from that study documented that median speeds across most areas of the state do not meet the Federal Communications Commission's (FCC's) criteria to qualify as broadband. The methodologies and core technologies pioneered by this research team are now having a major impact on data collection efforts across the country.[3]

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[1] As exemplified by the introduction of the Broadband Data Improvement Act [BDIA] in the U.S. Congress in June 2019. BDIA's goal, according to the bill's cosponsors, is to require "broadband providers to report data to create an improved National Broadband Map that is significantly more accurate and granular, and subject to an ongoing and multi-faceted challenge, validation, and refinement process." See: McMorris Rodgers, "McMorris Rodgers, O'Halleran Introduce Bipartisan Legislation to Improve Broadband Mapping in Rural Communities," https://mcmorris.house.gov/mcmorris-rodgers-ohalleran-introduce-bipartisan-legislation-to-improve-broadband-mapping-in-rural-communities/. Accessed on June 10, 2020.

[2] Former FCC Chairman, Tom Wheeler, stated on May 27, 2020, "The COVID-19 pandemic has highlighted the critical nature of access to fast and affordable internet service. Demand for high-speed internet access, defined as "broadband," has soared to new heights...The internet is no longer 'nice to have,' it is critical." See: Tom Wheeler, "5 steps to get the Internet to all Americans," https://www.brookings.edu/research/5-steps-to-get-the-internet-to-all-americans/. Accessed on June 10, 2020.

[3] As two examples, the National Telecommunications and Information Administration's National Broadband Availability Map integrates data and methodologies developed as a part of the "Broadband Availability and Access in Rural Pennsylvania" initiative (see: https://broadbandusa.ntia.doc.gov/map); and the state of North Carolina is currently doing likewise (see: Ryan Johnston, "North Carolina looks to challenge FCC over broadband coverage," https://statescoop.com/north-carolina-fcc-challenge-broadband-maps). Accessed on June 10, 2020.

While access to broadband is an essential prerequisite to adoption, our understanding of why non-adoption is higher across rural communities has been limited by a lack of empirical documentation.

One key argument used to explain this urban-rural digital divide – one that has been often reiterated by Internet Service Providers (ISPs) – has been the declaration that rural areas lack sufficient return-on-investment (ROI) to make rural buildout feasible. Often, this cost-benefit analysis is predicated on a notion that the lower population density of rural communities is further confounded by assumptions of lower take rates (percentage of eligible people who adopt broadband service), less disposable income, and less interest in broadband connectivity, as explaining the persistent lower adoption rates spanning large swaths of rural America.

The further assumption has too often been that potential rural customers are a less viable market due to an intrinsic lower level of interest in broadband connectivity. Meanwhile, national regulatory and policy agencies have eschewed inquiry into actually verifying the fundamental assumptions being made by ISPs; and the research literature, by and large, has likewise been relatively silent on empirically deriving a basic measure of the price elasticity of demand for broadband (i.e., how does interest in broadband change given different pricing).

This research aimed to fill this gaping hole in understanding the issues that are driving today's digital divide, providing a series of exploratory analyses based on survey data collected from rural and urban broadband customers across Pennsylvania. By looking at factors such as "willingness to pay" and existing pricing differentials within speed tiers, these analyses provide a unique first look into factors that continue to create substantial barriers to closing the digital divide.

This study was conducted using a hybrid telephone/SMS (short message service, or "text messaging") polling methodology of 1,446 registered voters throughout Pennsylvania in May and June of 2020. These surveys asked respondents to answer a number of broadband speed, broadband pricing, willingness to pay, and demographic questions. Key results from these analyses include findings of substantial technological and speed tier differentiators between rural and urban constituencies, but also a higher "willingness-to-pay" measure (for 25 Megabits per second, or Mbps, broadband service) in rural

areas of the state than among urban respondents. These findings help shed new light on the real costs (to consumers) and potential revenue-generation to entities that build broadband services for rural constituencies.

Data for this study were collected in cooperation with Public Policy Polling – a firm with expansive experience in conducting nationwide polling on a variety of subject matter – employing a questionnaire developed by the project team from the X-Lab and key project partners. The international team of broadband researchers convened for this project included researchers whose expertise spans: network research; telecommunications technologies; federal, state, and municipal broadband regulations and policies; and statistical, geospatial, and econometric analysis.

This year-long research effort focused principally on measuring willingness to pay to generate an empirically derived broadband price elasticity of demand curve. By exploring potential differentials between rural and urban broadband pricing, broadband service bundling, and willingness to pay for 25 Mbps broadband, this research provides a compelling first look at several relatively underexplored phenomena.

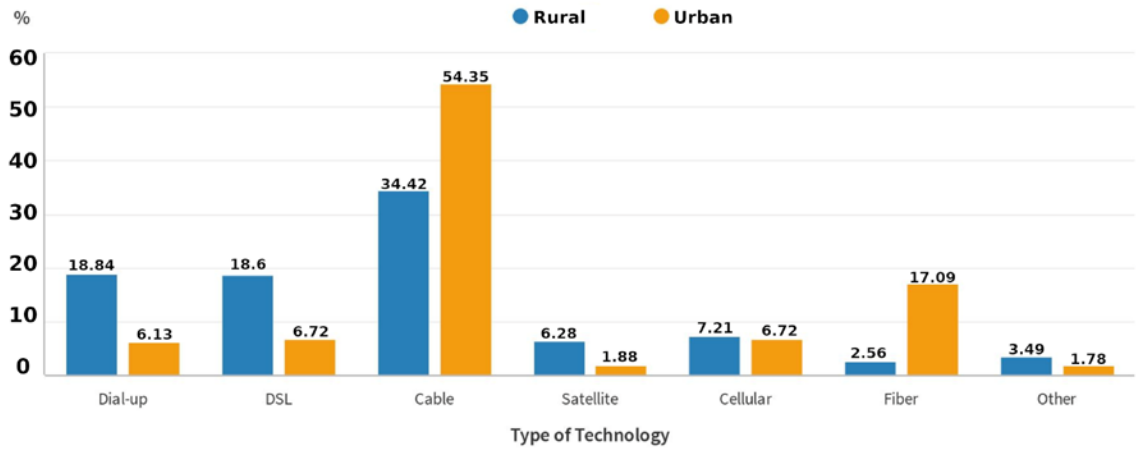
Key findings

The principal findings from this study are decidedly relevant for policymakers interested in how demand for broadband service is impacted by price (i.e., price elasticity of demand); and also have implications for initiatives seeking to close the digital divide; for funding agencies supporting broadband build-out; and for local, state, and national officials investigating the state of broadband connectivity across Pennsylvania and the rest of the country.

Key findings include the following:

1. Substantial service provision technology differentials exist between urban and rural communities, with urban respondents reporting far higher use of cable and fiber internet connectivity and rural respondents reporting higher use of dial-up, DSL (Digital Subscriber Line), and satellite internet connections.

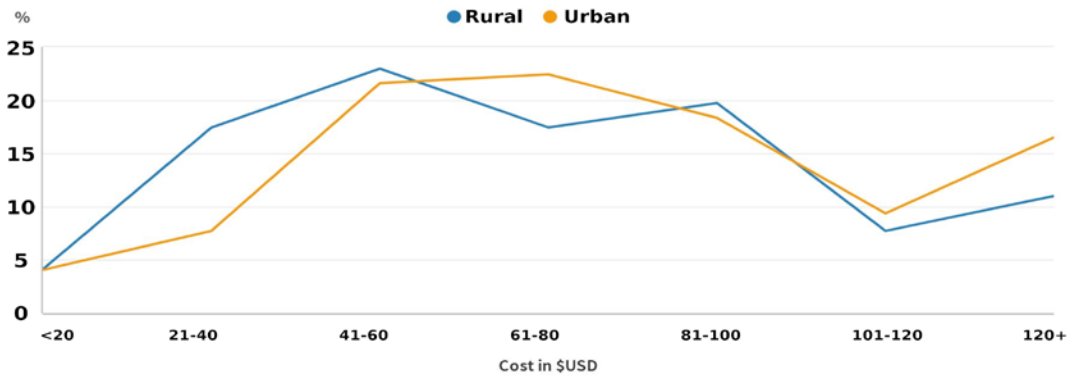
Rural vs. Urban Breakdown of Types of Connection Technology in Pennsylvania



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

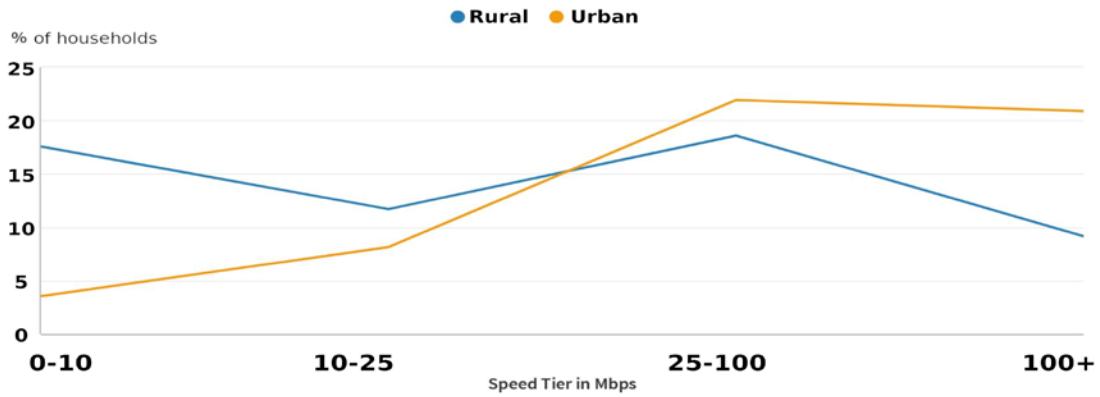
2. Pricing data alone masks substantial differences within speed tiers between urban and rural constituencies.

Rural vs. Urban Breakdown of Cost for Internet Service



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

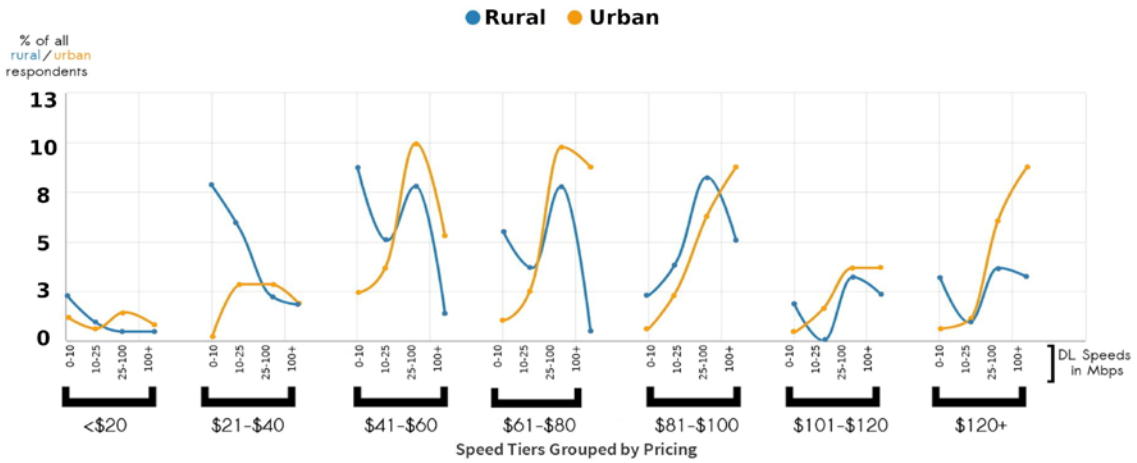
Rural vs. Urban Broadband Internet Speed Tiers



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

3. Within pricing tiers, the more in-depth investigation of real-world speeds documented that rural respondents were overrepresented within slower speed services, while urban respondents were more likely to have faster speeds; thus, dollar for dollar, rural respondents often received slower speeds than their urban counterparts.

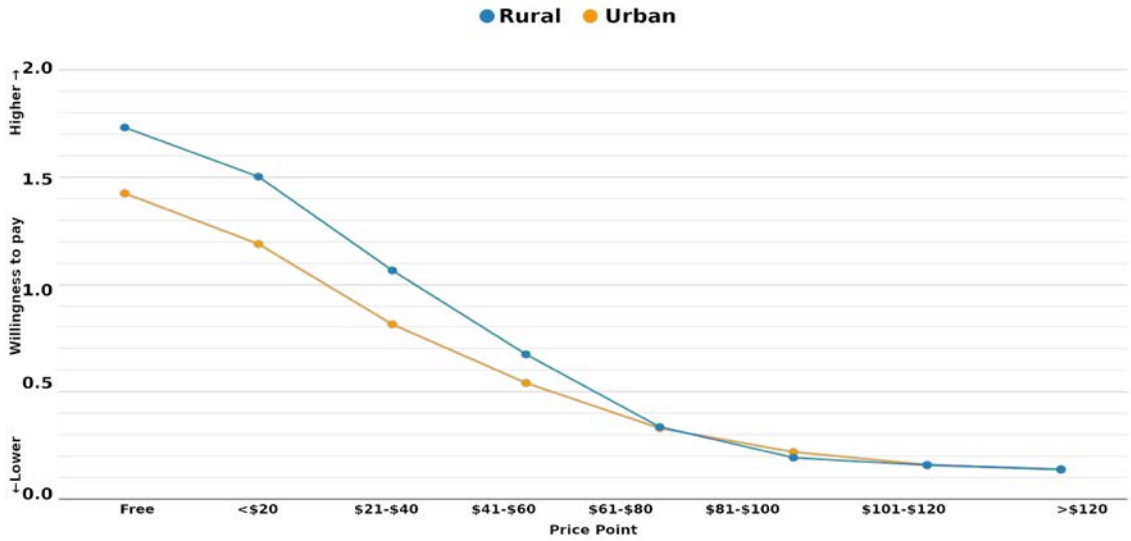
Rural vs. Urban Residential Pricing Over Speed Tier



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

4. The price elasticity of demand curve for broadband service provides evidence that there's a "sweet spot" in terms of willingness to pay, as well as relatively static "unwillingness to pay" for services above $80/month. In addition, at lower price tiers (less than $60/month), rural respondents had a consistently higher willingness to pay than corresponding urban respondents.

Price Elasticity of Demand Curve for Rural and Urban Pennsylvania



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Policy implications

The policy implications for this research are important, lending credence to the notion that urban and rural constituencies are receiving systematically inequitable service, not only in terms of speeds available, but also in terms of price for those services.

Therefore, Pennsylvania should change its current definition of "broadband" – as 1.544 Mbps download and 128 kilobits per second upload speed[4] –to meet or exceed (long-established) federal definitions for broadband. The commonwealth's definition is so antiquated that it is slower than the FCC's 2010 "update" to 4Mbps/1Mbps, as well as its 2015 definition. Because state service provision requirements are predicated on the antiquated definition instead of the national standard, they are creating substantial harm by promulgating the provision of substandard services to communities across the commonwealth.

[4] See: Pennsylvania Department of Economic Development, "Broadband Resources," https://dced.pa.gov/broadband-resources/. Accessed on June 10, 2020.

According to this research, it appears that, when speed and price are held stable, rural constituencies may have a higher interest in broadband adoption than urban residents.

However, current instantiations of government support mechanisms for broadband buildout (including the $16 billion Rural Digital Opportunities Fund administered by the FCC and the $100 billion in broadband subsidies proposed by Congress in the 2020 Moving Forward Act) have thus far failed to mandate adequate data collection to ensure that inequities are addressed. Therefore, it is important to establish greater transparency and standardized public disclosure of broadband service characteristics including speed, regular pricing, and service limitations.

The research also points to the need for a statewide study to assess and empirically derive a broadband affordability formula and model for how much most low-income households can afford to spend on broadband without having to sacrifice other necessities such as rent, food, and medical care.

And, as suggested in earlier research on broadband availability and access, and the delivery of broadband in unserved and underserved areas of Pennsylvania, policymakers should maximize the options for broadband service provision by allowing other viable entities, such as community-based networks, municipalities, and cooperatives, to deploy broadband across rural Pennsylvania.

This research provides a considerable level of documentation and insight into the broadband willingness to pay of rural residents across Pennsylvania.

As a part of X-Lab's commitment to open source, peer review, and supporting ongoing research into the digital divide, the data, graphs, methodologies, equations and tools used in the development of this report are being made freely and publicly available to enable other researchers to further explore these exploratory analyses. The research team hopes that replication and confirmation of these findings will be undertaken and that further refinement will be conducted and integrated into future efforts to bridge the digital divide.

In conducting the literature review for this project, the research team identified a dearth of existing broadband price elasticity of demand studies; as such, the team and its collaborating partners were required to produce a new survey tool and methodology, both of which should provide a useful basis

for further inquiry. Additional (more granular) research at the local, state, national, and international levels would help to shed light on how widespread (and substantial) pricing within speed tier differentials are; as well as how price elasticity of demand curves for different constituencies may vary. Along with measuring availability of actual broadband speeds, the ability for government, community and civic organizations to document willingness to pay in areas where broadband adoption is low would provide a key measure of potential discriminatory implementation practices unfairly targeting specific areas.

If one of the main findings stemming from these exploratory analyses holds – that rural constituents are demonstrably more willing to pay a higher fee for 25/3 Mbps broadband service than their urban counterparts – it would lend credence to the notion that the lower adoption rate must be due to differentiated service offerings (and not just cost). Likewise, documenting this higher willingness-to-pay rate would help ease concerns that take rates would be lower in rural areas (they should, in fact, be higher at most price points) and could help defray the attendant costs of buildout in areas with lower population densities. In turn, this would underscore that ROI models developed for urban buildouts may underestimate revenue streams among rural constituencies.

This work, although very useful on its own merits as a stand-alone document that specifically focuses on willingness to pay for 25/3 Mbps broadband service (and the associated price elasticity of demand curves), is complemented by the analyses stemming from the 2019 research, "Broadband Availability and Access in Rural Pennsylvania." An integrated mapping/visualization platform combining these data sources would enable Pennsylvania to identify not only where substandard service exists, but where demand in these underserved areas is highest, thus enabling far more targeted deployment of broadband implementation efforts.

Contents

Introduction

Needs Statement and Related Research

Broadband connectivity is crucial for access to engagement in civic and political life[5] and the health of our modern economy.[6] Unfortunately, few studies of current broadband demand characteristics exist[7] – especially regarding price elasticity of demand[8] (i.e., how price impacts customers' willingness/ability to purchase connectivity). Without these vital analyses, policymakers risk being left in the dark as they work towards bridging the digital divide and bringing about universal connectivity.

Official U.S. government statistics claim that 95 percent of the population have access to broadband, yet only around 70 percent of all Americans have actually adopted broadband at home.[9] According to the Center for Rural Pennsylvania, 3.4 million Pennsylvanians live in rural counties,[10] and prior research has found that the adoption divide is even more pronounced when looking at rural vs. urban constituencies, with home broadband use at 60 percent in rural communities, compared to 70 percent among urban constituencies.[11] The stark difference between access and adoption is crucial to understanding key nuances of the digital divide.

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[5] See: Davison, Elizabeth L., and Shelia R. Cotten. "Connection Disparities: The Importance of Broadband Connections." *Handbook of Research on Overcoming Digital Divides: Constructing an Equitable and Competitive Information Society: Constructing an Equitable and Competitive Information Society* (2009): 346.

[6] See: Lehr, William H., Carlos A. Osorio, and Sharon E. Gillett, "Measuring Broadband's Economic Impact" (https://www.andrew.cmu.edu/user/sirbu/pubs/MeasuringBB_EconImpact.pdf) and the more recent assessment of broadband on home prices and purchasing trends, Meyer, Hariett, "https://www.theguardian.com/technology/2014/mar/02/fast-broadband-vital-to-homebuyers." Accessed on June 10, 2020.

[7] See: Katz, Raul L., and Taylor A. Berry. *"Driving demand for broadband networks and services."* Springer International Publishing, 2014. Accessed on June 10, 2020.

[8] See: Galperin, Hernán, and Christian A. Ruzzier. "Price elasticity of demand for broadband: evidence from Latin America and the Caribbean." *Telecommunications Policy* 37, No. 6 (2013): 429-438; and, Glass, Victor, Stela Stefanova, and Ron Dibelka. "Customer Price Sensitivity to Broadband Service Speed: What are the Implications for Public Policy?" *Smart Data Pricing* (2014): 35-45.

[9] See: the Federal Communications Commission. (Mar 2010). *Connecting America: The National Broadband Plan*.

[10] See: the Center for Rural Pennsylvania, "Demographics » Quick Facts," http://www.rural.palegislature.us/demographics_about_rural_pa.html. Accessed on June 10, 2020.

[11] See: the Federal Communications Commission. (Mar 2010). *Connecting America: The National Broadband Plan*.

Nationwide, the adoption of broadband access at home has remained relatively unchanged for the past decade, increasing from 70 percent in 2013 to 73 percent in 2016 – and then staying relatively stagnant since then.[12] The recent research from the Pew Research Center shows that the high cost of a broadband connection is the most important reason why non-adopters choose not to subscribe at home.[13] Yet the price elasticity of demand for broadband connectivity remains relatively undocumented. Thus, three key analyses this study addresses include:

1. What is the cost of connectivity in rural Pennsylvania;
2. How does broadband pricing impact demand by rural Pennsylvania residents; and,
3. What can policy makers at the state and local level do to drive universal, affordable connectivity throughout Pennsylvania?

Today, economic security requires access to the internet.[14] This reality is made all the more stark by the recent coronavirus pandemic and attendant shelter-at-home best practices currently in place across the state. As network penetration rates increase and adoption becomes more normative, the basic goods, services, and information required for an informed, economically successful, and active citizenry are rapidly migrating online.[15] In a post-coronavirus world, access to these resources is becoming increasingly difficult for those left offline, transforming inequality into a crisis of exclusion from civic and economic society.[16] A study by the Investigative Reporting Workshop found that the best values for broadband were in affluent areas; while poorer areas were paying slightly less per household, on average,

[12] According to the Pew Research Center's February 2, 2019 survey of internet use (the latest findings as of this writing), home broadband use only increased from 70% to 73% between 2013 and 2019. See: Pew Research Center, "Internet/Broadband Fact Sheet," https://www.pewresearch.org/internet/fact-sheet/internet-broadband. Accessed on June 10, 2020.

[13] When asked "to identify the *most important reason* they do not have a home broadband subscription, non-adopters are again more likely to cite the monthly cost of broadband service than any other reason." See Pew Research Center, John B. Horrigan and Maeve Duggan, "Barriers to broadband adoption: Cost is now a substantial challenge for many non-users," http://www.pewinternet.org/2015/12/21/3-barriers-to-broadband-adoption-cost-is-now-a-substantial-challenge-for-many-non-users/. Accessed on June 10, 2020.

[14] See: Alliance for Affordable Internet, "Affordability Report 2014," http://a4ai.org/affordability-report/report. Accessed on June 10, 2020.

[15] See: Knight Foundation, "Informing Communities: Sustaining Democracy in the Digital Age," (2009) https://knightfoundation.org/reports/informing-communities-sustaining-democracy-digital/. Accessed on June 10, 2020.

[16] See: Landale & Meinrath, "The Future of Digital Enfranchisement," in *Media Activism in the Digital Age*.

they received significantly slower broadband speeds (i.e., the poor were paying more per unit of connectivity).[17] This divide is even more pronounced considering that actual broadband speeds are often significantly slower than advertised speeds.[18]

Research in Alberta, Canada, conducted comparative analyses on return on investment of already-constructed fiber optic networks and new broadband installations. Regardless of the level of sunk costs (i.e., investments that have already been made), all of the scenarios were projected to have a positive return on the initial investment.[19] This points to a need for substantial reassessments of the return on investment (ROI) associated with rural broadband buildout as it appears that assumptions and parameters that are predicated on urban build-outs may substantially understate rural ROI given these research results.

The opportunity costs of not providing communities with affordable access have very real impacts on the economic health of communities. A 2006 MIT study found that "between 1998 and 2002, communities in which mass-market broadband was available by December 1999 experienced more rapid growth in employment, the number of businesses overall, and businesses in IT-intensive sectors, relative to comparable communities without broadband at that time."[20] Several studies have looked at the impact of broadband access on rural communities. "New Media, Technology and Internet Use in Indian Country,"[21] provides a paradigmatic methodology to study internet use in rural communities. A 2012

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[17] See: Dunbar, John. (2011, Feb 28). "Wealthy suburbs get best broadband deals; D.C., rural areas lag behind." *Investigative Reporting Workshop*, https://www.benton.org/headlines/wealthy-suburbs-get-best-broadband-deals-dc-rural-areas-lag-behind. Accessed on June 10, 2020.

[18] See: OfCom, "Average Speed is still less than half advertised speed," Press Release, March 2, 2011. https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2011/average-broadband-speed-is-still-less-than-half-advertised-speed; and FCC, "FCC Broadband Performance OBI Technical Paper No. 4," August 2010. https://docs.fcc.gov/public/attachments/DOC-300902A1.pdf. Accessed on June 10, 2020.

[19] See: Casurella, Peter. "SouthGrow Study Shows Huge Impact of Investments in Broadband Infrastructure." http://coalhurst.ca/wp-content/uploads/2019/12/Economic-Development-Newsletter-December-11-2019.pdf. Accessed on June 10, 2020.

[20] See: Gillett, S. E., W. H. Lehr, C. A. Osorio, and M. A. Sirbu. "Measuring Broadband's Economic Impact. Final Report Prepared for the U.S. Department of Commerce, Economic Development Administration National Technical Assistance, Training." *Research, and Evaluation Project* (2006): 99-07. http://cfp.mit.edu/publications/CFP_Papers/Measuring_bb_econ_impact-final.pdf Accessed on June 10, 2020.

[21] For sample questions and nationally normed surveys see Morris, Traci L., and Sascha D. Meinrath. "New media, technology and Internet use in Indian Country: Quantitative and qualitative analyses." (2009)

study by the Hudson Institute analyzed opportunity costs for households, including education, healthcare, telecommuting, and e-services, as well as broadband's impact on businesses and large institutions.[22] Prior to this, a 2008 study of Broadband Internet Use and Rural Development in Pennsylvania[23] reflected on how different sectors were engaging in transactional or transformational uses of the internet, and provided qualitative descriptions of how these sectors, including government, healthcare, and education, were leveraging broadband access. This research, however, was conducted in 2005-2006, with the report concluding, "There is no silver bullet or single solution to the challenge of broadband utilization."[24] Given the rapid developments in information technology in the ensuing years, inquiries into this area of inquiry are overdue.

Project Background

Broadband connectivity is crucial for access to the modern economy, as well as for engagement in contemporary social, educational, and political life. Without adequate study of the availability of broadband connectivity, policymakers are left in the dark as they design programs to modernize communications infrastructure and ensure that telecommunications companies provide broadband/internet service at the minimum speeds required to take full advantage of online resources (from distance education and telehealth to online shopping and civic engagement). In 2019, the Center for Rural Pennsylvania published the research, "Broadband Availability and Access in Rural Pennsylvania," to

[22] Kuttner, Hanns. "Broadband for rural America: Economic impacts and economic opportunities." *Economic Summit on the Future of Rural Telecommunications, Washington, DC* (2012). https://www.hudson.org/content/researchattachments/attachment/1072/ruraltelecom-kuttner–1012.pdf. Accessed on June 10, 2020.

[23] See: Glasmeier, Amy K., Chris Benner and Chandrani Ohdedar, Department of Geography and Earth and Environmental Systems Institute, and Lee Carpenter, Children, Youth and Families Consortium, Pennsylvania State University, "Broadband Internet Use in Rural Pennsylvania." http://www.rural.palegislature.us/broadband2008.pdf. Accessed on June 10, 2020.

[24] See: Glasmeier, Amy K., Chris Benner, Chandrani Ohdedar, and Lee Carpenter. "Beyond the Digital Divide: Broadband Internet Use and Rural Development in Pennsylvania," Final Report to the Center for Rural Pennsylvania. (2007)

provide policymakers with extensive empirical analyses and concise implications regarding on-the-ground broadband availability for rural residents.

The research collected a total of 11,082,742 speed tests from across Pennsylvania in 2018, and mapped actual on-the-ground speeds to counties, and state House and Senate districts. All 67 counties were represented in this dataset, and only five counties (Sullivan, Forest, Cameron, Clinton, and Potter) had fewer than 10,000 tests run in 2018 (with only two counties – Sullivan and Forest – having fewer than 1,000 test results). The number of tests by county spanned between 734 (Sullivan County) to 1,664,918 (Philadelphia County), with the median number of test results by county of 52,946. This mapping effort was the first comprehensive mapping of actual broadband connectivity for Pennsylvania, and acts as an essential new data source for policymakers interested in addressing current digital divides across the state.

Since 2018, the X-Lab research team, in partnership with project partners, has automated many aspects of the prototype that has been developed for Pennsylvania, resulting in an ongoing data collection and visualization tool that continues to collect over a million tests from Pennsylvania residents every month. In addition to statewide speed measures, this platform (available at https://measurementlab.net/visualizations), also provides weekly updates of current broadband speeds for all 18 Congressional districts and 67 counties, as well as over 1,150 ZIP Codes across the state. In collaboration with the Marconi Society, the research team will also be unveiling a new survey research tool to collect more granular broadband speed data (e.g., street and address-level breakdowns) in late 2020.

This research, "Broadband Demand: The Cost and Price Elasticity of Demand in Rural Pennsylvania," serves as the next logical complement to this earlier work, providing an important first look at how broadband pricing differs between urban and rural constituencies in Pennsylvania, and empirically deriving as an initial assessment a price elasticity of demand measure that enables key decision makers to better understand how broadband adoption is influenced by price.

Over the course of this initiative, the research team was surprised to learn that empirically derived measures of price elasticity of broadband demand were nearly non-existent. While several corollary studies have been conducted previously, this initiative represents the first time that several of these core research questions and concomitant findings have been publicly released. Given this unexpected dearth of prior work, and to help facilitate further inquiry in this domain, the project's methodology, survey tools, and raw data are all being made freely and publicly available to the research community, along with this report.

Support for Research Need

The ability to accurately measure price elasticity of demand (PED) for broadband connectivity is a key factor in helping policymakers determine how Pennsylvania can best bridge the rural/urban digital divide and ensure that reliable, affordable broadband internet access is universally available across Pennsylvania. While many U.S. commentators and regulatory agencies have stressed that the U.S. is often situated within the top-25 countries when it comes to broadband speeds, an independent study conducted by cable.co.uk places the United States in 119th place worldwide in terms of broadband pricing, stating that "while broadband in the United States is widely available and uptake is high, lack of competition in the marketplace means Americans pay far more than they should compared to much of the rest of the world."[25] This relatively substantial discrepancy (between speed and pricing) remains almost entirely undocumented within official governmental measures of broadband connectivity, but likely represents a driving force behind the persistence of continuing (U.S.) digital divides.

Throughout the research team's review of existing literature and prior studies on broadband price elasticity, the team observed a concerning dearth of resources directly related to the topic; but, curiously, no shortage of content discussing the importance of conducting such research. Much of the existing

[25] See: Dan Howdle, "The cost of fixed-line broadband in 206 countries," https://www.cable.co.uk/broadband/pricing/worldwide-comparison. Accessed on June 10, 2020.

research revolves around tangentially relevant topics not directly related to terrestrial broadband price elasticity in the U.S. As examples:

- Comparisons of different pricing concepts and business models (flat, priority, edge, etc.), but without going into pricing or price elasticity itself;[26]
- Specific studies on using metered time-of-day pricing approaches for broadband connectivity (a model that is more common in countries other than the U.S.);[27] and,
- Compare and contrast research looking into fixed versus mobile broadband market definitions (as well as arguments for and against mobile broadband being categorized together with fixed broadband for determining price elasticity [without actually deriving this measure]).[28]

The FCC's own literature, which explicitly underscored the importance of measuring terrestrial broadband price elasticity, stopped short of performing these analyses and did not provide any sort of framework for how such research could be conducted.[29] More worrisome still, the majority of broadband pricing studies reviewed focused almost exclusively on urban areas and urban population centers – as was the case with New America's otherwise-comprehensive "Cost of Connectivity" analysis[30], which undertook comparative analyses of connectivity pricing mainly in metropolises around the world. A 2019

[26] See: M. Falkner, M. Devetsikiotis and I. Lambadaris, "An overview of pricing concepts for broadband IP networks," in *IEEE Communications Surveys & Tutorials*, vol. 3, no. 2, pp. 2-13, Second Quarter 2000, https://ieeexplore.ieee.org/abstract/document/5340798. Accessed on June 10, 2020.

[27] See: C. Joe-Wong, S. Ha and M. Chiang, " Time-Dependent Broadband Pricing: Feasibility and Benefits" *2011 31st International Conference on Distributed Computing Systems*, Minneapolis, MN, 2011, pp. 288-298, https://ieeexplore.ieee.org/abstract/document/5961710. Accessed on June 10, 2020.

[28] See: Lukasz Grzybowski, Rainer Nitsche, Frank Verboven, and Lars Wiethaus, "Market definition for broadband internet in Slovakia – Are fixed and mobile technologies in the same market?" in *Information Economics and Policy*, September 2014, https://www.sciencedirect.com/science/article/pii/S0167624514000286. Accessed on June 10, 2020.

[29] See. for example, the FCC's sixth "International Broadband Data Report," wherein the FCC aims to "compare fixed and, for the first time, mobile broadband (LTE) speeds in the United States with the selected countries, to the extent data are available. We improve upon our pricing comparison from previous reports by providing a more comprehensive assessment of the competitiveness of broadband in each country and the value that broadband providers are delivering to consumers," https://docs.fcc.gov/public/attachments/DA-18-99A1.pdf. Accessed on June 10, 2020.

[30] See: Nick Russo, Danielle Kehl, Robert Morgus, and Sarah Morris, " The Cost of Connectivity 2014", New American Foundation, 2014, https://www.newamerica.org/oti/policy-papers/the-cost-of-connectivity-2014/. Accessed on June 10, 2020.

congressional report[31] regarding the state of the digital divide makes no mention of broadband price, price elasticity, or broadband plan affordability beyond looking at the incomes of American adults who do not have broadband internet access; unsurprisingly, this congressional inquiry found that access to broadband services rose in accordance with income levels.

Among government organizations, researchers, and the private sector, there is a substantial gap: widespread acknowledgement that price elasticity is critically important in driving broadband adoption, on the one hand, and actual data collection that would document and proof out price elasticity models for various constituencies, on the other. This is all the more surprising given the growing understanding that rural constituents have been systematically underserved, with concomitant lowered broadband adoption rates.

In informal interviews with more than two dozen broadband researchers spanning private industry, present and former government officials, and non-governmental leaders, this knowledge gap was both perceived to be highly problematic, as well as highly salient to contemporary policy-making needs. Thus, although there appears to be a clear consensus of the importance and urgency of developing a reusable model to map broadband price elasticity geographically, both within states and nationwide, very little work towards such an undertaking has occurred as of the publication of this report.

While this dearth of knowledge afforded the project team with little prior-related research to build upon in following established "best-practices," methodologies, and data sources, this also provides Pennsylvania with one of the first glimpses at this important phenomenon. Likewise, by pioneering a new, rigorous, transparent, and replicable methodology, this research provides a much requested prototype for future studies of broadband price elasticity.

Thus, the research and methodologies used here serve as a set of guidelines for other entities that wish to conduct their own broadband price elasticity studies. The research team anticipates that, as more

[31] Congressional Research Service, Broadband Internet Access and the Digital Divide: Federal Assistance Programs, October 2019.

of these analyses are commissioned and completed, the process and methodologies will be refined and adopted as a standard that can then be implemented across the nation.

Goals and Objectives

The overarching goal of this research project was to provide initial documentation of the cost structure and demand curve for broadband internet service in rural and urban Pennsylvania. For the purposes of this proposal and analyses, "broadband" is defined using the FCC's current definition of a minimum of 25 Mbps download speed. Five critical research objectives were identified that, taken together, helped accomplish the project goal.

First, the project team developed the statistical model for price elasticity of demand for rural Pennsylvania by drawing from existing theoretical models and translating the necessary inputs for these models into willingness-to-pay questions that could be asked of Pennsylvania residents. This was an essential step since the soundness of the findings from this research are predicated on a solid theoretical underpinning. As part of this objective, the team first conducted a survey of existing price elasticity of demand literature, both domestically and internationally, to ensure that the analyses used comported with best practices within the field. As discussed, while several theoretical models were identified, the lack of substantive "real-world" testing of these models was a surprising discovery; however, by leveraging questions based on standard broadband utilization survey research, the research team was able to implement a data collection regime that would yield statistically significant statewide results at the end of this process. Surveying the literature also enabled the researchers to determine which demographics may impact price elasticity and tailor the survey instrumentation to ensure this information was collected.

Second, the team surveyed self-reported broadband pricing across Pennsylvania. To accomplish this, the project team developed a sampling protocol predicated upon the inputs identified from the prior literature review, ensuring that the data garnered were generalizable to the demographics of Pennsylvania. These variables were used to generate a randomized list of respondents (drawn from Pennsylvania voting

records, which ensured that only adults were contacted); in turn, these responses helped generate measures of broadband pricing for different tiers of service (speeds) for both urban and rural areas of the state. While the survey sample size was substantially larger than initially planned (1,446 instead of the original 1,000-respondent goal), this is still deemed insufficient for drawing inferences at the local level, pointing to the need for further, more granular analyses. However, this sample was extensive enough to enable the research team to investigate differences between urban and rural constituents at seven different price points and four discrete speed tiers, which led to several significant findings.

Public Policy Polling, the partner organization that conducted the surveys, was tasked with collecting the randomized sample of Pennsylvania voter responses and provided both raw data as well as weighted results of survey responses. During initial comparative analyses based upon the first survey collection period, discrepancies between weighted and unweighted percentiles, though present, were found to be relatively modest; and upon completion of the second collection of survey data, remained so. Thus, the research team used unweighted survey responses in the final analyses and graphs. It should be noted that no substantive differences were found between the results whether using the weighted or unweighted survey responses.

Third, the research assessed individuals' willingness to pay for broadband connectivity. The project mirrored several questions developed by prior research initiatives, which also enabled the team to generalize Pennsylvanians' preferences to national survey samples, and helped avoid introducing unrelated issues and research techniques into the survey instrument. The survey was administered using a hybrid methodology, using both an interactive voice response (IVR) telephone survey and an interactive text messaging (SMS) methodology. Public Policy Polling reported that IVR tends to oversample from rural and older constituencies while SMS tends to skew toward urban and younger respondents. Thus, using this hybrid model helped balance the survey results, as was borne out in the closeness of the comparative analyses of weighted (to mirror Pennsylvania's overall demographics) vs. unweighted survey response demographic percentages.

Fourth, after pricing and willingness-to-pay information was collected, the project team determined the price elasticity of demand for Pennsylvania residents. In looking at changes in willingness to pay (i.e., likelihood of adoption), one can see that price elasticity of demand for broadband services is highly elastic – with willingness to pay plummeting until around the $80/month mark (at which the measure levels off, indicating relatively equitable *unwillingness* to pay at higher price points). These results underscore that adoption rates become increasingly suppressed at higher price points; however, prior to converging at the $61-80/month mark, it should be noted that the price elasticity of demand curves, when broken out by urban versus rural respondents, are meaningfully different: at price points $41-60/month and lower, rural respondents reported a *higher* willingness to pay (for broadband service) than urban respondents. This finding indicates that, holding price steady, demand for broadband connectivity in rural areas may be higher than in urban locales.[32] This finding raises significant questions regarding why adoption levels are so much lower in rural areas and points to pricing being highly discrepant between the two. As further analyses indicated, when looking within a particular pricing tier, one finds that a higher percentage of rural respondents receive *slower* speeds than their urban counterparts; while a higher percentage of urban respondents receive *faster* speed tiers (at the same price point) than rural survey respondents. Survey results underscore two key findings stemming from this research initiative:

1. Rural constituencies appear to have a *higher* level of demand for broadband connectivity than urban residents at price points under roughly $60/month; and,
2. At almost every price point (i.e., holding price steady), a higher percentage of rural respondents received slow-tiered service (than urban respondents), while a higher percentage of urban respondents received faster connectivity speeds than rural survey respondents.

[32] Willingness-to-pay measures were derived from averages on a four-point Likert scale ranging from "Very interested" to "Not interested at all." Percentages of respondent responses in each category are available in the appendices.

Thus, taken together, it appears that rural constituencies, even though they have a higher demand for broadband connectivity than urban residents, are being provided lower broadband service speeds than urban respondents at almost every price point. This is particularly perplexing since ISPs (Internet Service Providers) have been reporting that availability of service is relatively equitable between urban and rural residents.

The fifth objective was to ascertain best practices and implications based on statistically significant results. For rural residents, these survey results have implications that may help drive buying decisions and negotiation tactics. For local municipal leaders, this may impact franchising negotiations, public works and connectivity initiatives. For state legislators, this survey helps inform legislative efforts (e.g., tax policies, rights-of-way rules, pricing disclosure mandates) and future data collection efforts that can contribute to driving informed, empirically-backed decision-making.

While the immediate project goal was to answer the questions laid out in the needs statement, that is, determining price elasticity of demand, assessing how this demand is being met, and identifying key barriers or opportunities to affordable broadband services throughout Pennsylvania, the implications stemming from these results are of the highest importance. As the most comprehensive effort of its kind, this research initiative derives an open, peer-reviewed methodology that can be generalized to other state and national efforts, and represents a current best practice for efforts seeking to determine how broadband pricing affects household broadband adoption. Confirmation of this initial exploration of demand and pricing/speed differentials between urban and rural constituents may help to explain why broadband adoption in rural communities lags behind those in urban communities.

As a result of the coronavirus pandemic, interest in and demand for broadband connectivity has skyrocketed. Between the $16 billion in funding from the FCC's Rural Digital Opportunities Fund, and the $100 billion currently being proposed as a part of the 2020 Moving Forward Act (HR2), the United States is in the midst of what may become the largest public investment in broadband buildout ever. However, without addressing the substantial pricing discrepancies identified by this research, these funds may simply exacerbate, rather than ameliorate, current digital divides.

Methodologies and Data Sources

Building on the methodology employed by the research team leader for the Open Technology Institute's annual "Cost of Connectivity" report,[33] "New Media, Technology and Internet Use in Indian Country: Quantitative and Qualitative Analyses,"[34] and subsequent work with the Executive Office of the President of the United States,[35] this research used a representative sample of rural and urban communities based on key demographics (e.g., geolocation, level of education, wealth, racial demographics) and compiled existing pricing and demand characteristics for both rural and urban areas.

Within the limited price elasticity of demand research literature, the core methodologies used to determine price elasticity of demand share several commonalities. First, as Madden, Suphachalasai, and Makjamroen's model demonstrates,[36] variables such as age, education, and income level may impact individual household price elasticity. Thus, the samples used for this analyses are identifiable along these dimensions. In addition, as Carare, McGovern, Noriega, and Schwartz found, "to achieve a 10 percent increase in broadband subscribership, an average price decrease of approximately 15 percent is needed,"[37] but those data were collected 7 years ago and more contemporary analyses may yield significantly different results. Likewise, Galperin and Ruzzier found that, "an average price reduction of 10 percent would result in an increase of almost 22 percent in the penetration rate,"[38] but those results were for the

[33] See: Russo, Nick, Robert Morgus, Sarah Morris, and Danielle Kehl. "The cost of connectivity." *New America Foundation* (2014). https://na-production.s3.amazonaws.com/documents/the-cost-of-connectivity-2014.pdf. Accessed on June 10, 2020.

[34] See: Morris, Traci L., and Sascha D. Meinrath. "New media, technology and Internet use in Indian Country: Quantitative and qualitative analyses." *Washington, DC: New America Foundation* (2009).

[35] See: the Council of Economic Advisers, March 2016, Issue Brief, "The Digital Divide and Economic Benefits of Broadband Access." https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160308_broadband_cea_issue_brief.pdf. Accessed on June 10, 2020.

[36] See: Madden, Gary, Suphat Suphachalasai, and Thanet Makjamroen. "Residential demand estimation for bundled fixed-line and wireless mobile broadband services." *Applied Economics* 47, no. 47 (2015): 5045-5056.

[37] See: Carare, Octavian, Chris McGovern, Raquel Noriega, and Jay Schwarz. "The willingness to pay for broadband of non-adopters in the US: Estimates from a multi-state survey." Information Economics and Policy 30 (2015): 19-35.

[38] See: Galperin, Hernán, and Christian A. Ruzzier. "Price elasticity of demand for broadband: evidence from Latin America and the Caribbean." *Telecommunications Policy* 37, no. 6 (2013): 429-438.

Latin American region and may or may not be generalizable to Pennsylvania. However, these studies do provide baseline findings that are useful in developing the project's survey instrumentation.

Using the existing FCC's National Broadband Map data set, the team identified the main broadband service providers offering fixed high-speed broadband and documented advertised pricing for their 25/3 Mbps (or greater) tier of service. These service providers reported that "broadband" service was universally available across rural areas of the state. The research team welcomed additional information from ISPs (e.g., service offerings and pricing by geolocation, census track speed and availability data, and other factors that may impact consumer demand and willingness to purchase); however, inquiries with these service providers requesting service pricing were rebuffed; and further requests from various industry and governmental sources provided no statewide data on broadband pricing. Thus, self-reported measures of broadband pricing became the only viable way to collect these data. As such the survey instrument collected data on several additional metrics, including:

1. Network technology (e.g., DSL, cable, fiber optic, etc.);
2. Download speed in megabits per second;
3. Monthly service cost;
4. Whether the service was stand-alone or bundled;
5. Demographic information; and,
6. Geolocation (ZIP Code of respondent).

The project team and partners constructed an interactive voice response survey and a targeted interactive text messaging protocol to determine local broadband demand and price elasticity among these selected constituencies. This survey instrument builds on decades of survey research experience and, whenever possible, uses nationally normed questions to determine household use and willingness to pay. Facets of this IVR/SMS survey help document several key demand characteristics (e.g., what residents currently pay for what speeds and their willingness to pay for broadband at different price points).

The results provide baseline information concerning different rural constituencies and enable analyses of the parallels and discrepancies between local residents and national norms (e.g., as per Carare,

McGovern, Noriega, and Schwartz, and/or any more recent national surveys that the literature review uncovers). These data enabled the team to statistically derive a demand curve for both rural and urban Pennsylvania residents. In addition, the research team was able to look at different service offerings *within* a pricing tier to see if urban and rural constituencies were receiving equitable services. While these results are likely to hold for business class and anchor-institution class broadband in both rural and urban areas, due to limitations in the sampling framework, the survey methodology was unable to capture this facet of pricing and price elasticity of demand.[39]

In addition, these survey results help explain why many interventions aiming to increase broadband connectivity have proven to be relatively ineffective. Achieving universal broadband connectivity was an explicit goal of Pennsylvania Act 183 of 2004. However, a 2011 snapshot of national averages by the FCC shows significant gaps between advertised speeds and observed speeds,[40] and last year's "Broadband Availability and Access in Rural Pennsylvania" report, published by the Center for Rural Pennsylvania, documented significant discrepancies between rural and urban areas of the state in the magnitude by which advertised and observed speeds differed.

Combining the project's survey data (which included automatic identification of the respondent's ZIP Code) with ZIP Code level designations of "urban" versus "rural" provided by the Center for Rural Pennsylvania (see Appendix 2), enabled mapping of individual responses to one of these two groups. Furthermore, cross-checks with self-reported urban/suburban versus rural identification demonstrated agreement in 81.45 percent of the cases.

Taken together, this multifaceted approach to documenting the pricing, demand, and price elasticity of demand in rural Pennsylvania provides the most extensive empirical analysis available of the current market for broadband services in rural Pennsylvania. For decision-makers striving to make

39 See: Benton Foundation, "Connecting Anchor Institutions: A Broadband Action Plan," http://www.shlb.org/uploads/G2G/Broadband%20Action%20Plan_SHLB.pdf. (Accessed on June 10, 2020) for a more in-depth discussion of community anchor institutions' role in the broadband service provision.

40 See: the FCC's "Measuring Broadband America" Figure 2. "Figure 2: Peak period sustained download performance, by provider." https://transition.fcc.gov/cgb/measuringbroadbandreport/9ActualVersusAdvertisedSpeeds.pdf. Accessed on June 10, 2020.

informed decisions, this research includes a wide range of useful resources to aid in their deliberations and policymaking. For residents of rural Pennsylvania, this work represents the first systematic effort to empirically document on-the-ground realities facing consumers searching for broadband connectivity, and a meaningful next step to ensuring that all Pennsylvania residents are provided with the opportunity to fully access and participate in the economic and social benefits that broadband connectivity affords. For service providers, this provides solid groundwork towards making a business case to invest in rural broadband infrastructure.

The research team developed the phone polling survey instrument in collaboration with Public Policy Polling (PPP), and this survey instrumentation was designed to ensure both maximum granularity in the data collected and accuracy in representing Pennsylvania's rural and urban makeup - for example, by employing both text messaging surveys (often favored by urban, younger respondents) and telephone surveys (favored by rural and older respondents). PPP has considerable national experience in polling, and respondents were selected and weighted comparative analyses were conducted to ensure that the results represented a realistic cross-section of Pennsylvania's population. The survey questions were answered by 1,446 participants spanning 670 ZIP Codes from across Pennsylvania. The numbers were obtained from lists of voters in Pennsylvania. The survey consisted of automated phone calls to households as well as texting to respondents who only have cellphones and no landline telephones. A total of 35,000 household landlines were called and 16,000 cellphone users were sent texts to gather complete responses from 1,446 participants.

In addition to willingness-to-pay questions and technology questions, the survey collected information on age group, ethnicity, education, gender and income levels. The survey was conducted in two parts: the first took place from May 21-23, 2020, and collected 605 responses, and the second took place from June 16-17, 2020, and collected 841 responses, for a total of 1,446 responses.

Once the data were collected, the project team performed a series of detailed, multidimensional analyses – taking into account rural and urban status, pricing, broadband speeds and other factors – to examine broadband price elasticity of demand in Pennsylvania. Differences in price elasticity of demand

between rural and urban areas of the state were of particular interest in this study; and a major focus of the graphical representation of the results has been to visualize discrepancies between rural and urban respondents. Furthermore, differences were also separated by other social and demographic grouping for the different pricing questions.

Organizational Roles

To accomplish the overarching project goals, the research project roles were divided among several organizational partners, each of whom drew upon prior related work to accomplish the data collection, statistical analyses, and price elasticity of demand modeling for this initiative. Briefly:

1. The Pennsylvania State University (PSU) was the host organization and oversaw back end logistics for the project, including financial accounting, budgetary information, and handling contract language. More information is available at: https://www.psu.edu; the X-Lab at PSU coordinated all facets of the project and led project management, research and analysis efforts, and outreach to project partners, advisors, industry representatives, etc. More information is available at: https://thexlab.org;
2. The Institute for Local Self-Reliance (ILSR) provided an organizational home for the survey results and any attendant personally identifiable information, as well as expert advice and peer review. More information is available at: https://ilsr.org;
3. Public Policy Polling conducted the survey, collected responses, and provided initial weighted descriptive statistics and additional peer review of the survey instrumentation. More information on is available at: https://www.publicpolicypolling.com;
4. Measurement Lab (M-Lab) provided updated broadband speed data and visualizations and additional peer review and has worked with the project team to develop a new survey portal that will enable generalizability of the survey instrumentation. More information is available at: https://www.measurementlab.net;

5. The Schools, Health, and Libraries Broadband Coalition (SHLB) provided expert advice and peer review, as well as updated information concerning several relevant national proceedings. More information is available at: https://www.shlb.org; and,
6. The Marconi Society provided additional project support, peer review, and project management assistance on the development of the new hybrid speed mapping/survey research portal. More information is available at: https://marconisociety.org.

Urban vs. Rural Geolocation Coding

To segment urban and rural areas of the state, the project team used the Center for Rural Pennsylvania's rural/urban definitions and applied them to each ZIP Code Tabulation Area (ZCTA) as defined by the U.S. Census Bureau. These designations are derived from a determination of the mean population density for Pennsylvania (based on 2010 Census data) and designation of ZIP Codes into two categories: those with populations greater than this mean (urban) and those with population densities less than this mean (rural).

The survey instrument also included a question polling respondents to self-identify their own rural, suburban and urban status. Grouping suburban and urban respondents via their self-reported status yielded a high correlation with the designations provided by the Center for Rural Pennsylvania (81.45 percent agreement), with discrepancies likely due, in part, to heterogeneity of population densities within specific ZIP Codes (for example, a ZIP Code that contains both rural and suburban areas). A total of four ZIP Codes were not found within the ZCTA listings and were dropped from the research analyses; given the high degree of agreement, the analyses provided in this report used the designations provided by the Center for Rural Pennsylvania.

Survey Instrument

Together with PPP, the project team developed a series of questions designed to help delineate the target populations along several key variables. While substantially more questions were initially generated, and a more in-depth survey instrument could provide additional insights, due to time-constraint best practices[41] regarding IVR/SMS survey instruments, the final survey instrument was distilled down to a core set of questions. The most complicated aspect of the survey instrument was determining how to best operationalize and document participants' willingness to pay for broadband service at different price points. With no prior survey examples to draw from, the research team had to rely on similar prior survey questions (for example, utilizing the same price and speed tiers) and expert review of the proposed question set. While the survey results lend credence to the notion that these questions have documented a fairly robust phenomenon, further confirmatory analyses (and exploration of the psychometric properties of these questions) is recommended.

As one example, instead of asking a single question with ranges regarding how much a user would be willing to pay for 25 Mbps broadband, it was agreed that the polling partner would split the question into several questions (See Appendix 1, Questions #5 through #12) and probe for the respondent's willingness to pay for service at each individual price point. The resulting data would then provide a more nuanced estimation of respondents' likelihood to purchase broadband connectivity and, as the results document, highlight potential discrepancies between urban and rural respondents. These questions likewise provide a granular – potentially more interesting – portrait of broadband demand, price elasticity, and willingness to pay, especially when contrasting rural and urban responses.

[41] Response rates for telephone and online surveys are known to drop dramatically as they get longer and/or take more time to complete. As such, the survey team aimed for a survey of under 20 questions that could be completed within roughly 10 minutes.

A Note on Weighting

PPP implements a proprietary weighting algorithm in its poll reporting for the demographic questions to bring them more in-line with the overall population of the state. The weighting algorithm accounts for age, race and gender, and the results are included in the final results. There are slight differences in the percentages being reported vs. the raw data results due to weighting of the poll for age and ethnicity. The project team calculated unweighted response results from the raw (unweighted) data to compare them to the weighted percentages, and generally found the differences to be around 0 percent-5 percent. Given this close match, and to maximize transparency and replicability of results, the graphs derived from these data sets and presented below use the unweighted data. The numerical analyses are also available in the appendices for review.

Survey Questions

The final survey questions posed to the 1,446 rural and urban respondents in May and June 2020 are in the appendices. The survey instrument collected information on whether respondent's services were bundled or stand-alone; however, respondents were not asked to break out the internet component of their monthly bills. The percentages of respondents with bundled services were roughly equal across rural and urban respondents (54.9 percent and 59.6 percent, respectively). This confounding factor was not expected to meaningfully impact the comparative analyses between these two groups.

Data Repositories

Attached to this document is a spreadsheet including the complete raw pricing survey results data, listing all responses for each question (in line with the survey instrument outlined above), ZIP Codes, label, calculated rural vs urban status (using the ZCTA list mentioned above). The raw data are also available from the Center for Rural Pennsylvania and archived with the Institute for Local Self Reliance.

Price Elasticity of Demand Curve

Price elasticity of demand is a measure of the change of quantity of a product that is demanded or purchased in relation to its price change. Elasticity can be highly responsive to changes in price (elastic) to relatively static (i.e., inelastic), with different points on a price elasticity of demand curve often spanning between the two. According to the Encyclopedia Britannica:

> Elasticity, in economics, [is] a measure of the responsiveness of one economic variable to another. A variable y (e.g., the demand for a particular good) is elastic with respect to another variable x (e.g., the price of the good) if y is very responsive to changes in x; in contrast, y is inelastic with respect to x if y responds very little (or not at all) to changes in x.[42]

Thus, if the price elasticity is high for broadband, then changes in price will dramatically impact adoption rates; whereas if broadband demand is inelastic, it should remain relatively stable, regardless of pricing.

ISPs have often held that building broadband in rural areas is unprofitable due to lowered population densities (and thus lower take rates).[43] Core to this assessment are assumptions that take rates are relatively similar between urban and rural constituencies. By measuring the price elasticity of demand, one can empirically test whether this is true and likewise whether one can expect that rural and urban constituencies would adopt a service offering at the same rate at similar prices. Survey results from this study document that the price elasticity of demand curve is highly elastic at lower and mid-level price points, becoming relatively inelastic at monthly pricing above $80. This lends credence to the notion that price (and not just availability) is a substantial determinant in broadband adoption.

There is a long-standing and well-established scarcity of data on consumer broadband pricing. This is largely due to the scarcity of federal reporting requirements as well as the bundling of broadband

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[42] See: Peter Bondarenko, "Elasticity," https://www.britannica.com/topic/elasticity-economics. Accessed on June 10, 2020.

[43] For example, statements include that it is "uneconomical to build wireline" broadband in rural areas; see: Joan Engebretson, "Exec: AT&T Fixed Wireless Planned for CAF-Funded Rural Areas," https://www.telecompetitor.com/exec-att-fixed-wireless-planned-for-caf-funded-rural-areas. Accessed on June 10, 2020.

services with telephone and cable television services, which masks the cost of internet connectivity as a stand-alone service. The FCC has reported multiple times that tens of millions of people are living in communities without adequate broadband access, with the largest blocks of underserved being low-income, central-city neighborhoods (often containing a substantial minority population) and more rural areas of the country. In 2020, coronavirus shelter-in-place practices have further exacerbated the digital divide, and while substantial new initiatives have been announced by various ISPs to provide so-called "low-cost" connectivity options to lower-income residents, these programs are themselves likely to be phased out once the immediacy of the coronavirus pandemic wanes.

Meanwhile, a hodge-podge of state-by-state programs to bridge the digital divide, while worthwhile, have by-and-large failed to collect meaningful pricing data, let alone any price elasticity of demand information.[44] Thus, while the goals of these programs are laudable, for example, "Minnesota has placed most of its broadband program in statute, including clear goals for broadband expansion, a state broadband office, and a fund to support broadband infrastructure,"[45] the on-the-ground impacts have been far less impressive, with these attempts to ensure that broadband services are affordable and reliable for every community, thus far failing to meaningfully "move the needle" in terms of increasing broadband adoption rates – a sad reality underscored by the fact that U.S. adoption rates have stagnated at under 75 percent for much of the last decade.

A Note on Broadband Pricing and the COVID-19 Crisis

The COVID-19 pandemic has made a large impact on the national discourse surrounding the need for broadband availability for all. Everyone from President Trump to Governor Wolf has pushed for any non-essential employees to work from home to avoid the spread of the virus. "Non-essential" also covers

[44] See: Staufer, Anne, et al. "How States Are Expanding Broadband Access." *The Pew Charitable Trusts*, www.pewtrusts.org/en/research-and-analysis/reports/2020/02/how-states-are-expanding-broadband-access. Accessed on June 10, 2020.

[45] See: Tomer, Adie, et al. "Digital Prosperity: How Broadband Can Deliver Health and Equity to All Communities." *Brookings*, Brookings, 27 Feb. 2020, www.brookings.edu/research/digital-prosperity-how-broadband-can-deliver-health-and-equity-to-all-communities/. Accessed on June 10, 2020.

countless educational institutions – spanning pre-schools to universities – and students have had to resort to online learning at all ages.

In the first half of March 2020, as schools prepared for spring break, a wave of colleges announced the cancellation of in-person classes. Over the following weeks, an overwhelming number of universities and K-12 schools joined nationwide efforts to minimize the spread of the coronavirus by transitioning to online classes.[46] However, initial CDC guideline estimates of two to eight weeks[47] quickly transitioned into cancelations of in-person courses for the remainder of the school year across much of the country. By March 27, 2020, 47 states mandated statewide school closures in response to the pandemic.[48]

Meanwhile, due to systemic availability and adoption shortcomings, ISPs have struggled to implement emergency measures that would provide some form of connectivity option for at least some of the newly housebound populace. Comcast, for example, made Xfinity hotspots available free, offered unlimited data for all its customers (in essence removing data caps that they had previously unilaterally instituted), and provided free home Wi-Fi for 60 days to some new customers. Dozens of other ISPs have acted similarly, providing a host of "special pricing" as a one-off intervention unlikely to ameliorate existing digital divides.[49]

On March 13, 2020, FCC Chairman Pai announced the "Keep Americans Connected Pledge,"[50] a voluntary commitment that ISPs ensure that their customers "not lose their broadband or telephone

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[46] See: Mike Baker, Anemona Hartocollis, and Karen Weise. "First U.S. Colleges Close Classrooms as Virus Spreads. More Could Follow." (March 6, 2020). Retrieved from: https://www.nytimes.com/2020/03/06/us/coronavirus-college-campus-closings.html. Accessed on June 10, 2020.

[47] See: Centers for Disease Control and Prevention (CDC). "Considerations for School Closure." 1, (March 13, 2020). Retrieved from: https://www.cdc.gov/coronavirus/2019-ncov/downloads/considerations-for-school-closure.pdf. Accessed on June 10, 2020.

[48] See: Ballotpedia, "School Closures in Response to the Coronavirus (Covid-19) pandemic, 2020." (March 27, 2020). https://ballotpedia.org/School_closures_in_response_to_the_coronavirus_(COVID-19)_pandemic,_2020. Accessed on June 10, 2020.

[49] See: National Digital Inclusion Alliance, "Free and Low-Cost Internet Service Plans," https://www.digitalinclusion.org/free-low-cost-internet-plans. Accessed on June 10, 2020.

[50] A public list of the companies who have made this pledge is available on the FCC website. See: https://www.fcc.gov/companies-have-gone-above-and-beyond-call-keep-americans-connected-during-pandemic. Accessed on June 10, 2020.

connectivity as a result of these exceptional circumstances."[51] Already signed by more than 800 companies and associations as of this writing, signatories pledged to:

1) not terminate service to any residential or small business customers because of their inability to pay their bills due to the disruptions caused by the coronavirus pandemic;
2) waive any late fees that any residential or small business customers incur because of their economic circumstances related to the coronavirus pandemic; and,
3) open their Wi-Fi hotspots to any American who needs them.

Left entirely unexplored was, once again, the obvious question surrounding broadband pricing that might pose such a financial burden to ISP customers in the first place.

Results

Pennsylvania's Residential Broadband Demographics

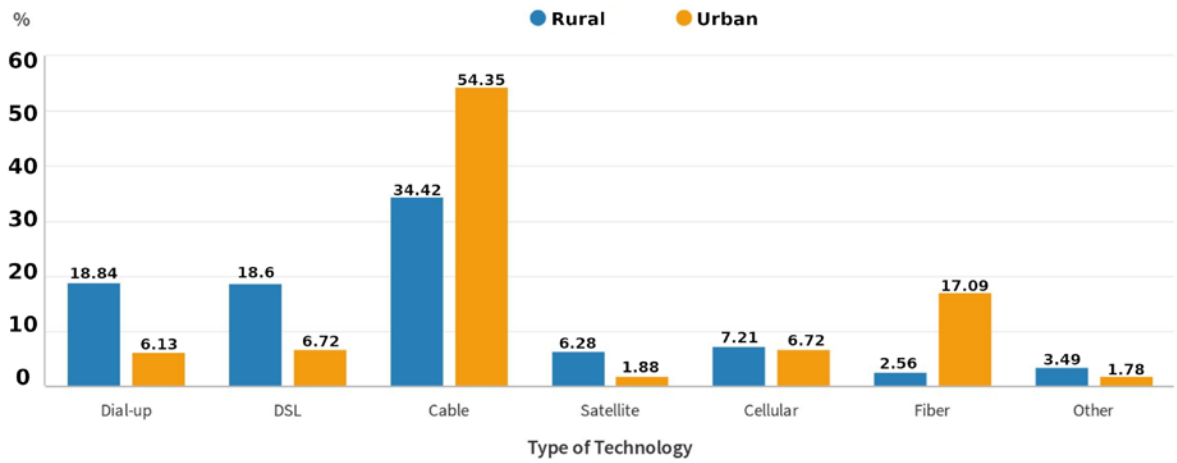
A corollary to the notion that "not all broadband is created equal" is that the underlying service delivery technologies for broadband service are crucially important. Federal agencies, including the FCC, have often elided various delivery mediums in their reporting of broadband availability measures, and that same inclination is currently coloring the debate over 5G as a supposed functional replacement for wireline connectivity. For much of rural America, the on-the-ground reality is that residents often do not have access to the same (higher speed) infrastructure as urban constituents.[52]

[51] See: FCC, "Keep Americans Connected," https://www.fcc.gov/keep-americans-connected. Accessed on June 10, 2020.

[52] See: Meinrath, S., Bonestroo, H., Bullen, G., Jansen, A., Mansour, S., Mitchell, C., Ritzo, C & Thieme, N. (2019). "Broadband Availability and Access in Rural Pennsylvania," The Center for Rural Pennsylvania, June 2019. https://www.rural.palegislature.us/broadband/Broadband_Availability_and_Access_in_Rural_Pennsylvania_2019_Report.pdf. Accessed on June 10, 2020.

Residential Internet Connection Technology

Figure A - Rural vs Urban Breakdown of Types of Connection Technology in Pennsylvania

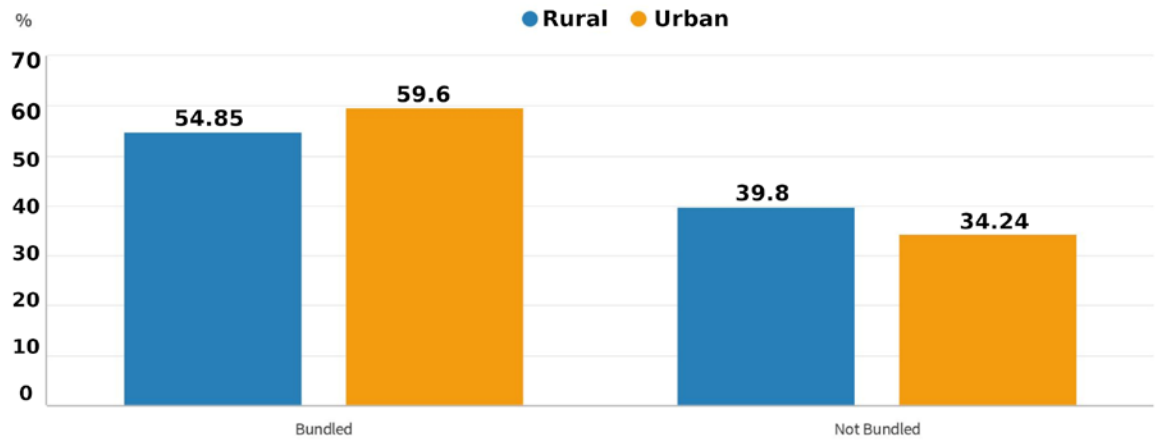


Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure A illustrates the different types of broadband technologies prevalent among rural and urban Pennsylvania survey respondents. From these data, one can clearly see that more than half of urban respondents (54.4 percent) have a cable internet connection, whereas the proportion of rural respondents with cable is just over one third (34.4 percent). For rural respondents, dial-up (18.8 percent) and DSL (18.6 percent) connections are also considerably more prevalent than for urban respondents (6.1 percent and 6.7 percent, respectively), and the same is true of satellite internet (6.3 percent vs. 1.9 percent for rural vs. urban respondents). However, the trend is opposite trend with Fiber, reaching close to ⅕ of urban homes (17.1 percent) and very few (2.6 percent) rural homes.

Residential Internet Bundling Rates

Figure B - Breakdown of bundled / unbundled Internet for Rural and Urban Areas

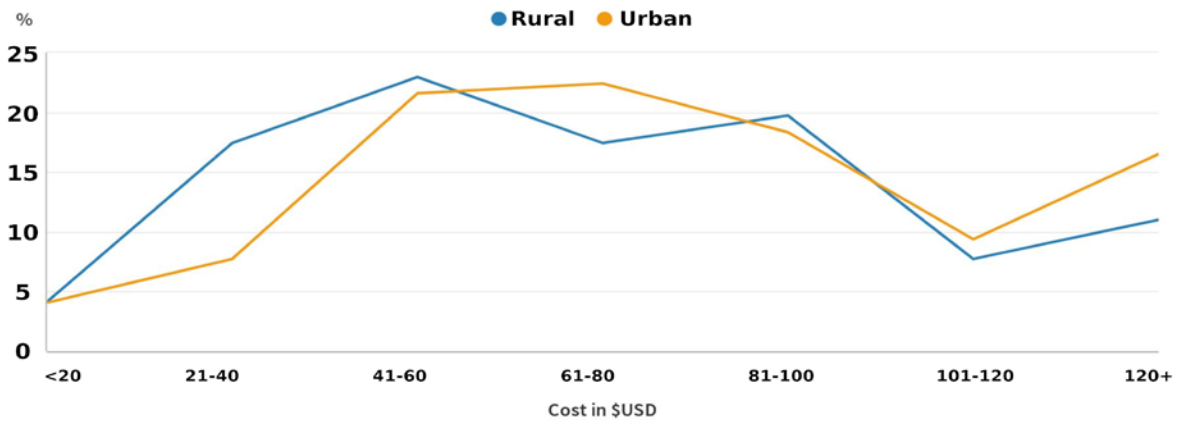


Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

The bundled/unbundled urban vs. rural breakdown in Figure B shows similar numbers for both demographics, with a slightly higher rate of bundled users in urban areas (59.6 percent) than in rural areas (54.9 percent). This includes bundling regardless of technology (i.e. cable, DSL, etc).

Residential Internet Monthly Cost

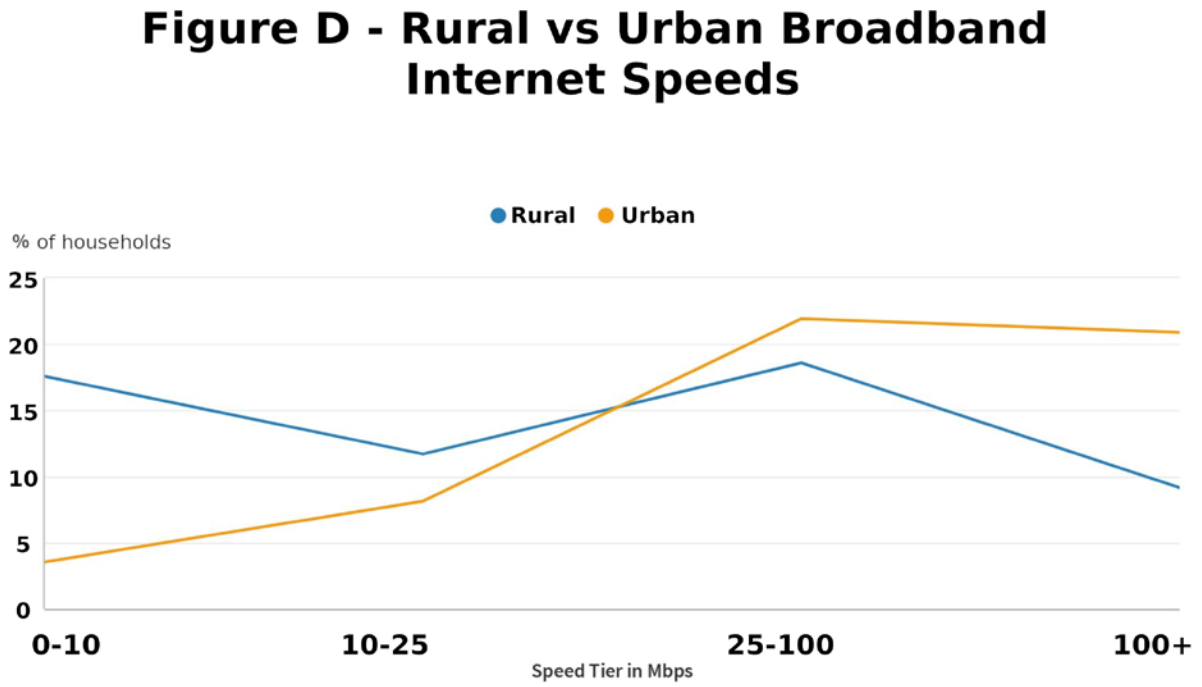
Figure C - Rural vs Urban breakdown of cost for home Internet service



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure C illustrates the percentage of users whose monthly broadband costs fall within each pricing band. While the overarching cost curves are relatively similar, one can see that, overall, there are slightly more rural users paying monthly costs in the $21-$40 range (17.4 percent vs. 7.7 percent), while there are slightly more urban users paying monthly costs of $120 or greater (16.5 percent vs. 11.0 percent). Taken alone, this implies that rural residents pay less for home connectivity than urban constituents; however, as shown below, the reality is far more complex. Given the similarity of cost curves, it is quite likely that segmentation by ISPs follows a fairly established business practice across urban and rural constituencies. And it should be reiterated that this graph does not account for broadband service speeds, but simply looks at the monthly cost for access to the respondents' broadband internet plan.

Residential Internet Download Speed



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure D illustrates the broadband internet speed tiers self-reported by survey respondents in rural and urban areas. In this graph, the key findings are:

- Far more rural respondents are on the 0-10 Mbps speed tier (17.6 percent) than urban respondents (3.6 percent);
- Likewise, somewhat more rural respondents are in the 10-25 Mbps tier (11.7 percent) than urban respondents (8.1 percent);
- This trend reverses at higher tier levels, with somewhat more urban respondents in the 25-100 Mbps speed tier (21.9 percent) than rural respondents (18.6 percent); and,
- There are far more urban respondents in the 100+ Mbps speed tier (20.9 percent) than rural respondents (9.2 percent) – more than twice the rate.

Overall, this points to a substantial interaction between urban vs. rural residency and speed of home internet connection, and these self-reported discrepancies comport with empirically derived broadband speed test results from rural and urban areas. Given that multiple statistically significant discrepancies using multiple methodologies all report the same finding (that urban residents receive far faster broadband speeds than rural residents), this begs the question of what is driving these differentials. One argument sometimes used to explain this phenomenon is that demand in rural areas is different than in urban environments, with rural constituents self-selecting slower speeds. As our findings below illustrate, this claim can be called into question.

Expected Price Elasticity of Demand

Broadband adoption levels among rural constituencies have consistently been lower than in urban areas of the country. While this is likely due to many factors, "availability" and "price" have been routinely mentioned as the main barriers rural constituents have been facing. And while broadband access and availability have been more widely studied, pricing of connectivity in rural areas has remained relatively unexplored. However, anecdotally, the research team has heard numerous stories from across Pennsylvania that rural residents are desperate for broadband connectivity.

As such, prior to performing the research survey and relevant analysis of urban and rural pricing data, the team hypothesized that demand for broadband in rural areas was equal to or greater than the demand in urban areas. Judging from the results of the 2019 report, "Broadband Availability and Access in Rural Pennsylvania," as well as many other publications that have shown the slower-than-broadband speeds experienced by a vast majority of rural constituents, it was felt that there were would likely be increased demand for broadband connectivity vis-a-vis urban areas – and, concomitantly, a greater willingness to pay for the higher speeds that were already more prevalent across many urban areas. The survey questions focused on the current FCC definition of "broadband" – 25 Mbps download and 3 Mbps upload – and it followed that regions where these speeds (or far greater ones) were already readily available (that is, areas which were already demonstrably well-served by broadband coverage) would,

naturally, have a lower level of demand than areas where this service was scarce to non-existent (i.e., far too many rural areas across the state).

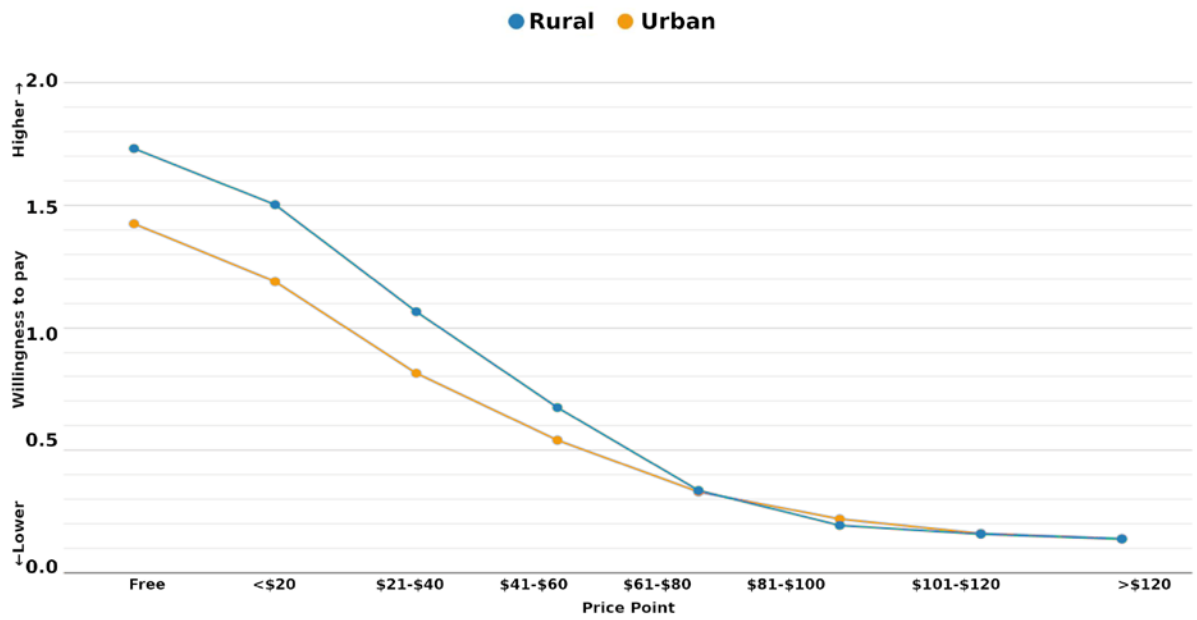
A corollary question that remained was exactly *how elastic* this demand would be, and, since rural areas often have lower wealth levels than urban areas, whether the demand for broadband services would be more heavily impacted by price. Thus, this research initiative focused on addressing the question of whether demand for broadband services among rural residents was similar to urban areas and, if not, were rural constituents prepared to pay more or less for access to basic 25 Mbps broadband than urban constituents.

In addition, because 25 Mbps broadband is far more readily available throughout many urban areas than rural locales (and that the median download speeds in urban areas can often far surpass 25 Mbps), 25 Mbps broadband might not seem attractive at *any price* to a subset of urban respondents (i.e., their connectivity needs may require far more than this bare minimum broadband speed). As such, 25 Mbps could represent a downgrade in speeds they already use. This contrasts sharply with measured speeds across substantial rural areas of the state, where 25 Mbps download speeds would be far *more* desirable than the much slower speeds many of them are currently experiencing.

Measured Price Elasticity of Demand

Based on answers to Questions 5-12 of the survey (asking respondents to indicate their willingness to pay for 25 Mbps broadband service at various price points), the research team was able to compute an initial demand curve for these services. As shown below, this price elasticity of demand curve illuminates a number of important facets of the underlying barriers to broadband adoption.

Figure E - Price elasticity of demand curve for Rural and Urban Pennsylvania



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure E illustrates the calculated price elasticity of demand curve obtained by measuring respondents' answers on willingness to pay at various price points. Willingness to pay measures are the averages of the responses from Questions 5-12 of the survey, "How interested would you be in subscribing to a 25 Megabits per second broadband internet service if it were more than [X price point]" (i.e., within each price tier), excluding responses marked as "not sure."

Respondents were divided into "rural" and "urban" groups based on the Center for Rural Pennsylvania's designation for the respondent's ZIP Code. Results were then inverted (i.e., 4 - resulting average) so that higher willingness pay was indicated by a higher value.

The benefits of asking respondents about their willingness to pay at several specific price ranges for 25 Mbps broadband – instead of simply asking how much they'd be willing to pay – provided the team with a far more nuanced measure of price elasticity of demand for both rural and urban

Pennsylvania residents. This allows for the creation of a significantly more detailed and revelatory elasticity of demand curve, one which paints a stark contrast between not only rural and urban demand for 25 Mbps broadband, but changing demand for broadband at several different price points. First, this curve reinforces the reality of the digital divide between urban and rural areas; and, it clearly illustrates that the demand – and therefore the market – for 25 Mbps at most price points not only exists throughout rural Pennsylvania, but may be even greater than that of urban areas in many cases.

Surveying the graph, it can quickly be ascertained that demand for 25 Mbps broadband is significantly higher for rural constituents than for urban constituents at every monthly price point at $60 or below. Demand for 25 Mbps broadband drops off significantly for both rural and urban respondents, flat lining at a high degree of "unwillingness to pay" at rates above $80/month. And broadband adoption is unlikely to be meaningfully increased until monthly costs drop below $60/month (in essence, all costs above this rate are relatively similar in their "dissuasion from adoption" impact). For both rural and urban respondents, this curve illustrates that monthly rates above $60 are considered simply too high a price to pay for minimum broadband service.

At any price point below $60, however, there is clearly more demand for broadband, and, of note, the demand levels are significantly higher at every price point under $61/month. This points to an increased level of demand in rural areas for baseline broadband services. Due to time limitations imposed by the survey methodology (in essence, the requirement that respondents be able to complete the survey in 5-10 minutes), this initiative was only able to look at willingness to pay for a single speed tier (25 Mbps) across fairly broad monthly pricing bands ($20 increments). Further research is needed, both to confirm these novel findings; and to investigate demand curves for various speeds, more nuanced pricing bands, and other factors that might shed light on what drives high (and low) levels of willingness to pay for broadband connectivity.

Expected Versus Measured Elasticity of Demand

While the resulting rural and urban price elasticity of demand curves roughly matched the expectations the team drew from anecdotal evidence, and its experiences and feedback received during its earlier research measuring broadband speeds across Pennsylvania, the starkness of these findings is sobering. While this analysis, as a first foray into an empirical determination of price elasticity of demand for broadband service, should be viewed as exploratory in nature, the consistency of findings and the statistical significance of the discrepancies found point to substantial holes in understanding what is currently driving the digital divide across Pennsylvania and the nation. Broadband pricing may, in fact, be a singularly important factor in improving broadband adoption; likewise, current Congressional deliberations, proposing a $50/month subsidy for home broadband connections, might inadvertently hamper efforts to close the digital divide over the long-term by reinforcing monthly service rates above $61/month (which, once the subsidy ends, would lead to significantly diminished adoption rates).[53]

These data clearly reinforce the notion that a high level of demand for basic 25 Mbps broadband service exists across rural Pennsylvania, as illustrated by the higher willingness to pay that rural respondents had over urban respondents at most price points. In essence, the real discrepancy between the expected and measured elasticity of demand is how significant this rural versus urban differential really is – there can be little doubt that there is a far higher demand for *affordable* broadband services among rural respondents than urban respondents.

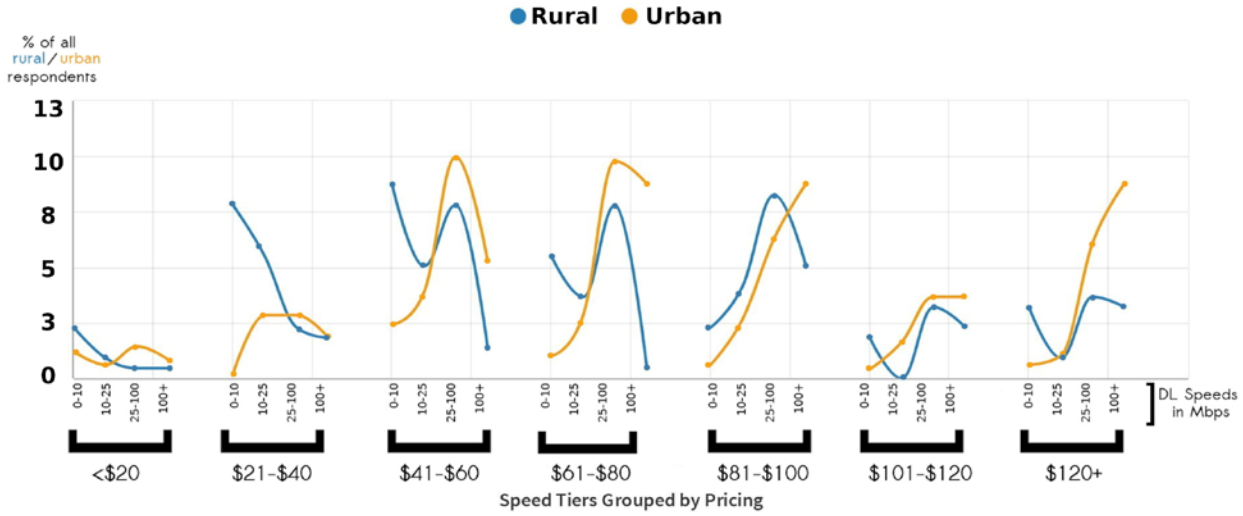
Residential Internet Service: Speeds by Price

Pricing alone fails to adequately document just how substandard the service offerings in rural areas actually are. There is a significant relationship between speeds adopted and price points, with a

[53] Mikesell and Galbreath discuss several facets of the use of subsidies, price controls, and amelioration of inflationary pressure and profit seeking in, "Subsidies and Price Control." In essence, subsidies can artificially inflate pricing or otherwise lead to more expensive service offerings over time (flood and fire insurance subsidies being often-cited contemporary examples). See: Raymond F. Mikesell and C. Edward Galbreath, The American Economic Review, Vol. 32, No. 3, Part 1 (Sep., 1942), pp. 524-537.

consistent interaction whereby rural areas are, dollar-for-dollar, consistently receiving slower service than urban respondents at every price point.

Figure F - Rural vs Urban Residential Pricing over Speed Tier



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure F encapsulates a rather bleak assessment of the state of broadband service offerings for rural residents, combining speed tier information within various price bands for urban versus rural survey respondents. By analyzing this combined information, a very clear picture of systematic underservicing targeting rural constituencies emerges – with significant differentials in "price vs. performance" or "Megabit-per-dollar" between rural and urban households holding across every price band studied. Furthermore, by breaking out survey respondents into urban and rural subgroups, it is clear that for any given price point under $80/month, rural respondents reported a *higher* willingness to pay for broadband service than urban respondents, with that willingness being highly significant at price points under $60/month. These results are important because they demonstrate that, given equitable price points, one

would expect adoption rates to be *higher* in rural areas than in urban locales. And, as prior speed test results document, adoption rates for various speed tiers are substantially *lower* across rural areas of the state.

Figure F segregates the price bands paid by respondents, then maps the speeds they are obtaining at each price point. Finally, the results are graphed out for both rural and urban respondents. This figure illustrates the following research findings:

- At every price point, there are always considerably more rural respondents with a broadband speed of 0-10 Mbps than urban respondents - but this difference is especially pronounced from the $21 - $80 price points.
- At any price point, but especially from $41 - $80, while the urban and rural curves follow similar trends in speed over pricing, the trend indicates that rural constituents tend to pay higher prices than urban constituents for the same - or slower - broadband speeds.
- 100+ Mbps broadband adoption is far more prevalent in urban areas than in rural areas, at every price point.

In sum, it appears that rural residents face a trifecta of disadvantages when it comes to connectivity: first, official measures of availability vastly overstate access to broadband; second, the magnitude of this discrepancy is far greater for rural areas than urban areas, thus further masking the extent of this digital divide (and, in the process, often making areas that are underserved ineligible for specific federal funding that is supposed to ease the digital divide in those very areas, as eligibility criteria for various federal funding programs are predicated on numbers that overstate broadband availability); and, third, even when connectivity is available, dollar for dollar, rural residents appear to be systematically receiving slower service than urban residents.

Taken together, this means that at every price point studied, rural residents are more likely to receive slower speeds than urban constituents; while urban residents are more likely to receive faster speeds than rural residents for the same price. Thus, while demand is *higher* for broadband connectivity in rural areas, rural residents are being offered *slower* speeds.

Implications and Conclusions

This research conducted one of the first-ever systematic modeling and empirical documentation of price elasticity of broadband demand for rural versus urban Pennsylvania residents, and represents one of the first analyses of its kind in the nation.

The research team's aim is not only to provide an in-depth analysis of current pricing for existing service tiers, but also to empirically derive how price and demand interrelate (and how efforts to lower pricing will affect increases in demand).

Building on earlier price elasticity of demand statistical models, the research team developed an empirically-backed model that fits Pennsylvania's residential broadband demand characteristics. This data collection effort includes demographic variables that may impact price elasticity of demand for various residents, and the outcome from this model provides a statistically significant "first glimpse" of how price impacts demand as well as discrepancies in the demand curves between rural and urban constituencies.

The research team has produced comparative analyses investigating different characteristics of current broadband service provision, with the goal of determining where discrepancies in these characteristics exist. These exploratory analyses can help in determining potential service provision concerns, as well as areas where further data collection and research may be necessary. The team also investigated successful initiatives that have spurred increased demand, spanning public, private, and public-private partnerships (see "Select Additional Literature" section below).

In keeping with the goal of developing a best-practice methodology, these research findings, data, methodologies, and survey instruments. have been made freely and publicly available under a Creative Commons non-commercial, share-alike, attribution license 4.0.

Overall, this research initiative aims to help forward the broadband research field as a whole by developing a best-in-class process for documenting how demand for Internet services and broadband pricing interrelate, and how one can measure discrepancies between the service provision characteristics of urban and rural residents.

Findings Summary

In conclusion, the main findings from these analyses are:

1. Substantial service provision technology differentials exist between urban and rural communities, with urban respondents reporting far higher use of cable and fiber connectivity, and rural respondents reporting higher use of dial-up, DSL, and satellite connections;
2. Pricing data alone masks substantial differentials within speed tiers between urban and rural constituencies; rural residents might seem to be paying less, but that appears to be because they have access to inferior connection options, which are cheaper, on average, relative to cable or fiber;
3. The more in-depth investigation of real-world speeds within pricing tiers documented that rural respondents are overrepresented within slower speed tiers, and urban respondents are more likely to have faster speeds;
4. Dollar for dollar, rural respondents often receive slower speeds than their urban counterparts;
5. The price elasticity of demand curve for broadband service provides evidence that an adoption "sweet spot" in terms of willingness to pay is in the under $60/month range, as well as relatively static "unwillingness to pay" for services above $80/month; and
6. When speed and price are held stable, rural respondents had a consistently *higher* willingness to pay than corresponding urban respondents.

Policy Considerations

The Pennsylvania General Assembly has committed to ensuring that all residents have access to affordable broadband services, and legislators have worked diligently to address the lack of universal connectivity that has long vexed rural Pennsylvania.[54] The 1993 Chapter 30 telecommunications law set

[54] As exemplified by the efforts of Rep. Pam Snyder and Sen. Kristin Phillips-Hill to create the Pennsylvania General Assembly's bicameral Broadband Caucus.

the goal of "universal telecommunications services at affordable rates while encouraging the accelerated deployment of a universally available state-of-the-art, interactive, public switched broadband telecommunications network in rural, suburban and urban areas." Achieving universal broadband connectivity was also an explicit goal of Pennsylvania Act 183 of 2004, which required that "The rural telecommunications carrier shall commit [...] to accelerate broadband availability to at least 80 percent of its total retail access lines in its distribution network by December 31, 2010, and 100 percent of its total retail access lines in its distribution network by December 31, 2015."[55] Verizon Pennsylvania, Inc. committed to achieving universal broadband access by this 2015 deadline, and claims that it has already met this obligation, despite substantial portions of rural Pennsylvanian communities lacking landline broadband connectivity.[56]

As recently as this current legislative session, Representative Pam Snyder introduced bills to expand broadband access in underserved areas (HB 2786), and to allow municipal authorities to deploy broadband internet infrastructure (HB 2055).[57] And Senator Kristen Phillips-Hill sponsored Senate Resolution 47 that directed the Joint State Government Commission to conduct a study of the delivery of high-speed broadband in unserved and underserved areas of Pennsylvania.[58] Given this recent history, the project team anticipates that these research findings will prove particularly salient to the work of the Pennsylvania House of Representatives Consumer Affairs, Agriculture and Rural Affairs, and State Government committees, and the Senate Communications and Technology Committee, among others.

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[55] See: Pennsylvania General Assembly, "PUBLIC UTILITIES CODE (66 PA.C.S.) - OMNIBUS AMENDMENTS," http://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2004&sessInd=0&act=183. Accessed on June 10, 2020.

[56] See: Jon Brodkin, "22 years after Verizon fiber promise, millions have only DSL or wireless," https://arstechnica.com/information-technology/2015/06/22-years-after-verizon-fiber-promise-millions-have-only-dsl-or-wireless/. Accessed on June 10, 2020.

[57] See: Pennsylvania General Assembly, https://www.legis.state.pa.us/CFDOCS/billInfo/billInfo.cfm?syear=2019&sInd=0&body=H&type=B&bn=2786, and https://www.legis.state.pa.us/cfdocs/billInfo/billInfo.cfm?sYear=2019&sInd=0&body=H&type=B&bn=2055. Accessed on June 10, 2020.

[58] See: "Delivery of High-Speed Broadband Services in Unserved Areas and Underserved Areas of the Commonwealth," Pennsylvania Joint State Government Commission, published in September 2020. http://jsg.legis.state.pa.us/. Accessed September 28, 2020.

The results from this initiative provide Pennsylvania policymakers with a strong indication of what measures need to be taken to accomplish the statutory goals they've laid out over the past 15+ years.

Most notably, Pennsylvania's current definition of "broadband" – as 1.544 Mbps download and 128 kilobits per second upload speed[59] – should be updated to meet or exceed (long-established) federal definitions for broadband. The commonwealth's definition is so antiquated that it is slower than the FCC's 2010 "update" to 4Mbps/1Mbps, and much slower than the FCC's 2015 definition. Because state service provision requirements are predicated on the antiquated definition instead of the national standard, they are creating substantial harm by promulgating the provision of substandard services to communities across the commonwealth.

Pennsylvania policymakers should also be able to identify measures that would increase demand through the creation of incentives, grant programs, and baseline service mandates that create optimal pricing structures (all predicated upon empirical models derived from statistically representative samples). Policymakers could use the statistical models developed here that would help identify the price point(s) that would most effectively encourage broadband adoption by various constituencies (with sub-$60/month broadband service offerings being essential in bolstering adoption levels, and service offerings above $80/month being unlikely to spur home broadband adoption).

To further advance demand, policymaker could commission a statewide study to assess and empirically derive a broadband affordability formula and the empirical modeling for how much low-income households can afford to spend on broadband without having to sacrifice other necessities such as rent, food, medical care, etc.

Also, as suggested in the 2019 report, "Broadband Availability and Access in Rural Pennsylvania," and the 2020 report, "Delivery of High-Speed Broadband Services in Unserved Areas and Underserved Areas of the Commonwealth," policymakers could maximize the options for service

[59] See: Pennsylvania Department of Economic Development, "Broadband Resources," https://dced.pa.gov/broadband-resources/. Accessed on June 10, 2020.

provision by allowing other viable entities, such as community-based networks, municipalities, and cooperatives, to deploy broadband across rural Pennsylvania.

Together, these findings and policy considerations will enable Pennsylvania to make the strongest case possible for support from various federal initiatives (e.g., eRate, the Universal Service Fund, and Lifeline link-up programs, the Rural Digital Opportunities Program), legislative earmarks (e.g., the pending Congressional $1.5 trillion infrastructure bill [HR2], which allocates $100 billion to support broadband adoption and universal service), updates to the Community Reinvestment Act to incentivize banks to invest in broadband infrastructure projects, and local/municipal block grant initiatives.

According to numerous government and industry insiders,[60] as the FCC continues to revamp its eRate and Universal Service Fund programs, states that have conducted in-depth studies documenting their need will be far more likely to provide compelling evidence and garner support from these multi-billion dollar funds. In addition to bolstering support for these and other grant programs, intra-state initiatives will be enhanced via access to updated broadband availability and demand data – helping spur efforts to alleviate poverty, provide health, education, and civic services, aid in the development of next-generation (online) resources for Pennsylvania residents, and adapt to the unprecedented conditions created by the global coronavirus pandemic.

Most importantly, legislators need up-to-date, accurate information to aid them as they develop policies that ensure that rural Pennsylvania is not left on the wrong side of the digital divide. This research initiative not only provides new crucial information regarding broadband pricing and demand, but has also developed an open, peer-reviewed methodology and open data store that can help ensure that state leaders are better able to monitor on-the-ground impacts of various broadband implementation and adoption efforts for years to come.

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[60] See, for example, Francella Ochillo, Christopher Mitchell, Andrew Jay Schwartzman, "Comments of Next Century Cities; The Institute for Local Self-reliance; Benton Institute for Broadband & Society; The National Digital Inclusion Alliance; Access Humboldt; The Center for Rural Strategies, Southern California Tribal Chairmen's Association, and X-lab" regarding "Establishing the Digital Opportunity Data Collection," and "Modernizing the FCC Form 477 Data Program" dockets. https://ecfsapi.fcc.gov/file/1092505707624/Final%20Comment%20-%20Digital%20Opportunity%20Data%20Collection%20-%20Filed%20on%2009.23.19.pdf. Accessed on June 10, 2020.

Arguably the most important policy lesson to draw from this study is the importance of continuing to perform and expand current documentation and broadband research efforts.

Throughout the literature review, and in examining other studies around the country and around the world, the research team collected numerous examples of studies on speed and pricing, but almost none looking at price elasticity (especially as empirically derived from real-world data). The dearth of preexisting data on broadband price elasticity can be explained by the relative complexity of collecting, analyzing, and measuring such data – as demonstrated within the methodology section of this report – but the importance of measuring price elasticity in the context of improving rural access to broadband cannot be overstated. These initial exploratory analyses will certainly be refined; however, they provide an innovative and compelling addition to our understanding of the contemporary state of broadband connectivity in the State of Pennsylvania.

In the report, "Broadband Availability and Access in Rural Pennsylvania," the project team clearly illustrated the digital divide between urban and rural regions of Pennsylvania regarding broadband speeds. Rural Pennsylvania generally experienced far slower broadband performance than urban centers, despite FCC maps showing universal broadband coverage across Pennsylvania. Many factors may account for these discrepancies, but one is that building out broadband networks in rural America can be more expensive than doing so in urban areas (due to myriad issues including difficult terrain, such as in many rural areas of Pennsylvania, and lower population density). Service providers are less inclined to build out infrastructure in rural areas if they feel that might not receive the same return on investment they are able to get in more urban areas.

However, the actual ROI calculation used by prospective ISPs to decide whether or not to build out capacity is opaque, and may rely on fundamental assumptions – such as average take-rates – derived from urban constituencies but then applied to rural areas. Furthermore, since there have been extremely few studies on willingness to pay for broadband looking at differentials between rural and urban residents, very few strong counterarguments to the profitability concern raised by the private sector have been proposed. By measuring how much people are willing to pay for varying speeds of broadband in areas of

different population density – as well as how many inhabitants are willing to pay – an evidence-based approach to calculating the ROI on building out rural infrastructure can be achieved. This study provides an essential "initial foray" into this domain.

These data-driven assessments can be offered to counter claims that building rural broadband is "inherently unprofitable" and undermines notions that demand for broadband connectivity is lower among rural constituencies (in fact, it appears to be as high or higher).[61] By documenting the price elasticity of demand for rural Pennsylvanians, the Commonwealth is now better positioned to understand potential discrepancies between estimated costs and revenue for network buildouts in these regions.

Secondly – and perhaps even more critical – is that many ROI estimations may be erroneously predicated on take rates derived from urban networks and then, as these results underscore, wrongfully applied to rural regions. At most price points, the percentage of rural residents indicating a willingness to purchase broadband service is higher than corresponding urban residents (and ROI and other assessments should be updated accordingly), which may substantially impact bottom-line profitability.

Given these findings, the project team suspects that the heightened level-of-interest in broadband connectivity among rural residents may surprise some ISPs, and that the potential income that could be earned from rural broadband service provision may be systematically underestimated.

[61] See, for example, Tri-County Rural Electric Cooperative's efforts to bolster connectivity throughout its service area, "Tri-Co Connections connects first customer in Coudersport area," http://www.tri-countyrec.com/content/tri-co-connections-connects-first-customer-coudersport-area. Accessed on June 10, 2020.

Acknowledgment of Support

This project was made possible, in part, by a grant from the Center for Rural Pennsylvania, a legislative agency of the Pennsylvania General Assembly and the support of generous core project partners:

ILSR - The **Institute for Local Self-Reliance** challenges concentrated economic and political power, and instead champions an approach in which ownership is broadly distributed, institutions are humanly scaled, and decision-making is accountable to communities. ILSR believes that democracy can thrive only when economic power is widely dispersed; communities are healthiest when they possess the authority, capacity, and responsibility to chart their own course. ILSR calls this vision local self-reliance. ILSR's Community Broadband Networks program fosters the creation of high-quality, locally accountable broadband networks. More information about how communities are investing in their own infrastructure to promote economic prosperity and improve quality of life is on ILSR's broadband page: https://ilsr.org/broadband.

X-Lab - The X-Lab is a future-focused think tank at Penn State University responding to the significant technology policy challenges facing society. X-Lab is composed of a consortium of technologists, developers, policy experts, innovators, business leaders, academics, entrepreneurs, researchers and futurists working to ensure that citizens don't need to choose between fundamental rights and equitable access to technological resources. X-Lab studies the implications of disruptive eventualities in sectors such as AI-driven manufacturing, telecommunications, consumer protections, privacy and civil liberty, and smart infrastructure. By bringing together experts from across the technological, political and scientific spectrums, X-Lab empowers leaders with the expertise to make better-informed decisions.

OTI - The **Open Technology Institute** works at the intersection of technology and policy to ensure that every community has equitable access to digital technology and its benefits. OTI promotes universal access to communications technologies that are both open and secure, using a multidisciplinary approach that brings together advocates, researchers, organizers, and innovators. OTI's focus areas

include surveillance, privacy and security, net neutrality, broadband access, and consumer privacy. OTI conducts data-driven research, develops policy and regulatory reforms, and builds real-world pilot projects to impact both public policy and physical communications infrastructure that people interact with every day. The Open Technology Institute supports free expression and open technologies at home and around the world, and is committed to supporting engaged, self-sufficient communities by promoting safe and affordable access to connectivity.

Select Additional Literature

Residential Demand Estimation for Bundled Fixed-line and Wireless Mobile Broadband Services

> "This article is the first investigation of residential internet markets in Thailand, in particular Bangkok. Bangkok is an interesting market to study as it is Thailand's most populous province, and supports an advanced economy. The study offers a comprehensive discussion of the process to obtain cross-price elasticity estimates when internet services are bundled. Interestingly, the empirical results reveal positive cross-price effects, i.e. internet alternatives are viewed as substitutes by respondents in this market. This finding is plausible as the services differ essentially in their model of delivery."

Madden, G., Suphachalasai, S., & Makjamroen, T. (2015). Residential demand estimation for bundled fixed-line and wireless mobile broadband services. Applied Economics, 47(47), 5045–5056. https://doi.org/10.1080/00036846.2015.1042141.

The Willingness to Pay for Broadband of Non-adopters in the U.S: Estimates from a Multi-State Survey

> "We use data from a large-scale survey of non-adopting households to provide estimates of their willingness to pay for broadband. A large fraction – approximately 2/3 – of the reporting households indicated that they would not consider subscribing to broadband at any price. For the remaining households who indicated that they would consider subscribing, we find strong evidence in the data of over-reporting at high values of the willingness to pay for broadband. We correct for reporting bias using a semi-parametric procedure. Our estimate of the price elasticity of demand for broadband using the bias-corrected willingness to pay values is equal to -0.62, markedly different from the estimate of -0.95 obtained with the values reported by the survey respondents. Our estimates indicate that, on average, to achieve a 10 percent increase in subscribership, a price reduction of about 15 percent is needed. In addition, we estimate the impact of several household characteristics on the likelihood of broadband adoption."

Carare, O., McGovern, C., Noriega, R., & Schwarz, J. (2015). The willingness to pay for broadband of non-adopters in the U.S.: Estimates from a multi-state survey. Information Economics and Policy, 30, 19–35. https://doi.org/10.1016/j.infoecopol.2014.12.001.

Price Elasticity of Demand for Broadband: Evidence from Latin America and the Caribbean

> "In this study the authors analyze fixed broadband retail prices in Latin America and the Caribbean (LAC), and provide estimates about the effect of price changes on broadband adoption. The analysis is based on a survey of plans and tariffs conducted by the authors during Q2 2010. Their results suggest that fixed broadband services in LAC are generally expensive and of poor quality when benchmarked against Organization for Economic Co-operation and Development (OECD) countries, although there is significant variance between markets in the region. In order to isolate the effect of prices on broadband adoption they use an instrumental-variable approach.

Their findings show that broadband demand is relatively elastic to price in LAC but not in the OECD. They estimate that an average price reduction of 10 percent would result in an increase of almost 22 percent in the penetration rate in LAC, equivalent to almost 8.5 million additional broadband connections. Several policy implications result from these findings. First, national broadband policies in LAC should pay a closer attention to a deficit of competition in fixed broadband services, as households and firms face high prices for poor quality services, thus deterring adoption. Second, while their findings generally suggest that price reductions could significantly increase penetration, their elasticity estimates reveal that price effects might not be sufficient to achieve the penetration goals set in national broadband plans. This validates the need for complementary policy strategies that affect other determinants of broadband demand. The example of Brazil is used to illustrate this finding."

Galperin, H., & Ruzzier, C. A. (2013). Price elasticity of demand for broadband: Evidence from Latin America and the Caribbean. Telecommunications Policy, 37(6–7), 429–438. https://doi.org/10.1016/j.telpol.2012.06.007.

Identifying the Determinants of Broadband Adoption by Diffusion Stage in Organisation for Economic Co-operation and Development (OECD) Countries

"Governments worldwide actively promote broadband development, owing to its positive impact on economic growth. Although many studies have identified the determinants of broadband adoption, this study re-examines the determinants by applying Arellano–Bond GMM dynamic panel data estimation with more complete panel data for OECD countries. The estimation can not only closely capture the dynamics of broadband diffusion but also solve an endogeneity problem existing in the estimations of previous studies. The estimation results indicate that content is also a significant factor, in addition to previous broadband penetration and platform competition, as commonly identified in previous studies. This study further examines and compares determinants

in different stages segmented by adopter categories proposed by Rogers. The results reveal different determinants in different stages. The key determinants are income, education, and content in the innovator and early adopter stage; platform competition and previous broadband penetration in the early majority stage; and broadband price in the late majority and laggard stage. Governments should thus devise and implement appropriate strategies for the major potential adopters in each stage instead of adopting a one-size-fits-all strategy. The results of this study provide a valuable reference for countries in early stages of broadband development or for those planning or reviewing their strategies."

Lin, M.-S., & Wu, F.-S. (2013). Identifying the determinants of broadband adoption by diffusion stage in OECD countries. Telecommunications Policy, 37(4–5), 241–251. https://doi.org/10.1016/j.telpol.2012.06.003.

The Ability to Pay for Broadband

"This paper presents findings from two studies: a national study of digital inclusion programs managed by community-based organizations in the USA that help people gain access to low-cost broadband and digital literacy skills; and a study of internet access and use in Detroit. Quantitative and qualitative methods were used to gain a deeper understanding of the ability of low-income individuals and families to spend money on broadband access at home. Findings show that although those with a limited monthly budget have an acute understanding of the value of home broadband, the costs associated with home broadband service make it difficult for them to afford. In considering this approach and its implications for digital inclusion policy in the USA, we argue that ability to pay provides a framework for understanding the local, cultural drivers and barriers to broadband adoption in low-income communities."

Rhinesmith, C., Reisdorf, B., & Bishop, M. (2019). The ability to pay for broadband. Communication Research and Practice, 5(2), 121–138. https://doi.org/10.1080/22041451.2019.1601491.

Socioeconomic Determinants of Broadband Non-Adoption Among Consumer Households in South Carolina, USA

> "The policy environment around broadband technology in the United States is shifting again and there are concerns about the impact these proposed changes will have on the future of rural broadband deployment and access. Similar to the Obama administration's discussion of net neutrality, reclassifying high-speed internet is again receiving growing media and policy attention at the federal and state level in the United States. Globally, it is argued that affordable high-speed internet access is imperative to rural and regional economic development success. The global digital divide and challenges of non-adoption impact both developing and developed nations. While many studies have focused on the availability and broad categories of adoption of high-speed internet, few have clarified non-adoption characteristics within states. In a largely rural state such as South Carolina, the issues of access and usage are increasingly relevant as broadband has the potential to improve the access and quality of a range of public and private services, as well as overall state and regional economic well-being. This study focuses on the characteristics of non-adoption of high speed internet in South Carolina, with a particular focus on rural households in the state. Through the use of a statewide survey of 1,200 South Carolina households, we determined which variables were significant for the non-adoption of broadband technology. Confirming international and national level research, the elderly, low income, and rural households across all demographics have lower broadband adoption. These results reveal opportunities to explore policy options that improve technology access across a range of low adoption and use groups in rural communities across the world."

Lori Dickes, Elizabeth Crouch, & Thomas Walker. (2019). Socioeconomic determinants of broadband non-adoption among consumer households in South Carolina, USA. Ager. Revista de Estudios Sobre Despoblación Y Desarrollo Rural, (26), 103–127. https://doi.org/10.4422/ager.2018.17.

A Cost-Benefit Analysis of Alberta Rural Broadband Deployment

> "Canada's perpetual problem with deploying essential infrastructure continues to be the low density of its population in relation to its large geographical footprint. Simply put, there are too few people spread out over too much space. When it comes to building infrastructure, this means that, relative to more densely populated jurisdictions, Canadians must build more infrastructure further, with fewer ratepayers to cover the costs. In practice, this means that private companies typically neglect deploying new facilities in low-density areas until the ROI can be justified, and that the public sector has often intervened to ensure that essential infrastructure reaches lower density regions. Throughout our history as a country this trend has held true for every type of essential infrastructure, including rail, highways, water infrastructure, gas, telephones, and now broadband."

Kien C. Tran, Ph.D., Jeff Davidson, M.Sc., Peter Casurella, M.A. (2019) A Cost-Benefit Analysis of Alberta Rural Broadband Deployment, Canada. Southgrow Regional Economic Development. https://bit.ly/38hh2T0.

Appendices

The following section contains the calculations behind the figures, additional full-page graphs and figures, polling results and the ZCTA (ZIP Code Tabulation Areas) look-up table to determine rural vs urban ZIP Code status that were used in this research study.

Appendix 1: Survey Results

Pennsylvania Survey Results

Q1 From the following list of choices, what is your primary home internet service connection- telephone line or dial-up; DSL or digital subscriber line such as CenturyLink or Frontier; cable modem internet such as Comcast; satellite internet such as ViaSat; cellular or mobile phone internet using a smartphone or mobile hotspot; a fiber-optic connection; something else; or, do you not have home internet service?

Telephone line or dial-up	12%
DSL or digital subscriber line	10%
Cable modem internet	44%
Satellite internet	3%
Cellular or mobile phone internet	9%
Fiber-optic connection	11%
Something else	3%
I do not have home internet service	8%

Q2 Approximately how much does your household pay PER MONTH for your home Internet service- less than $20, between $21 and $40, between $41 and $60, between $61 and $80, between $81 and $100, between $101 and $120, more than $120, or is your home internet service free?

Less than $20 per month	8%
$21-$40 per month	12%
$41-$60 per month	19%
$61-$80 per month	17%
$81-$100 per month	14%
$101-$120 per month	7%
More than $120 per month	13%
I have free home internet service	1%
Not sure	11%

Q3 Is the price you pay per month for your home internet service part of a bundled package purchased together with cable TV or phone service?

Yes	57%
No	35%
Not sure	8%

Q4 What is the download speed of your current home Internet service- between 0 and 10 megabits per second, between 10 and 25 megabits per second, between 25 and 100 megabits per second, more than 100 megabits per second, or are you not sure?

0-10 megabits per second	10%
10-25 megabits per second	11%
25-100 megabits per second	19%
More than 100 megabits per second	16%
Not sure	44%

Q5 How interested would you be in subscribing to a 25 Megabits per second broadband internet service if it were free- very interested, somewhat interested, not that interested, or not interested at all?

Very interested	26%
Somewhat interested	17%
Not that interested	12%
Not interested at all	31%
Not sure	13%

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Q6 How interested would you be in purchasing 25 Megabits per second broadband internet service if it were less than $20 per month- very interested, somewhat interested, not that interested, or not interested at all?

Very interested	20%
Somewhat interested	17%
Not that interested	15%
Not interested at all	36%
Not sure	13%

Q7 How interested would you be in purchasing 25 Megabits per second broadband internet service if it were between $21 and $40 per month- very interested, somewhat interested, not that interested, or not interested at all?

Very interested	9%
Somewhat interested	15%
Not that interested	17%
Not interested at all	46%
Not sure	13%

Q8 How interested would you be in purchasing 25 Megabits per second broadband internet service if it were between $41 and $60 per month- very interested, somewhat interested, not that interested, or not interested at all?

Very interested	5%
Somewhat interested	9%
Not that interested	17%
Not interested at all	55%
Not sure	14%

Q9 How interested would you be in purchasing 25 Megabits per second broadband internet service if it were between $61 and $80 per month- very interested, somewhat interested, not that interested, or not interested at all?

Very interested	3%
Somewhat interested	5%
Not that interested	14%
Not interested at all	65%
Not sure	14%

Q10 How interested would you be in purchasing 25 Megabits per second broadband internet service if it were between $81 and $100 per month- very interested, somewhat interested, not that interested, or not interested at all?

Very interested	2%
Somewhat interested	3%
Not that interested	11%
Not interested at all	71%
Not sure	13%

Q11 How interested would you be in purchasing 25 Megabits per second broadband internet service if it were between $101 and $120 per month- very interested, somewhat interested, not that interested, or not interested at all?

Very interested	2%
Somewhat interested	2%
Not that interested	9%
Not interested at all	75%
Not sure	13%

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Q12 How interested would you be in purchasing 25 Megabits per second broadband internet service if it were more than $120 per month- very interested, somewhat interested, not that interested, or not interested at all?

Very interested	2%
Somewhat interested	2%
Not that interested	7%
Not interested at all	76%
Not sure	13%

Q13 If you are a woman, press 1. If a man, press 2. If you are gender non-binary, press 3.

Woman	52%
Man	46%
Gender non-binary	2%

Q14 If you are Hispanic or Latino, press 1. If white, press 2. If Asian or Pacific Islander, press 3. If Black or African-American, press 4. If American Indian or Alaska Native, press 5. If other, press 6.

Hispanic or Latino	6%
White	71%
Asian or Pacific Islander	4%
Black or African-American	12%
American Indian or Alaska Native	1%
Other	6%

Q15 If you are 18 to 34 years old, press 1. If 35 to 44 years old, press 2. If 45 to 54 years old, press 3. If 55 to 64 years old, press 4. If 65 years or older, press 5.

18 to 34	24%
35 to 44	16%
45 to 54	19%
55 to 64	19%
65 years or older	22%

Q16 Do you live in an urban area, a suburban area, or a rural area? If you live in an urban area, press 1. If a suburban area, press 2. If a rural area, press 3.

Urban area	26%
Suburban area	42%
Rural area	32%

Q17 Which of the following best describes the highest level of education you have received: some high school but did not finish, high school graduate, some college but did not finish, 2-year college degree, 4-year college degree, post-graduate degree, or do you not care to say?

Some high school but did not finish	6%
High school graduate	35%
Some college but did not finish	16%
2-year college degree	8%
4-year college degree	18%
Post-graduate degree	12%
Don't care to say	5%

Q18 What is your approximate annual household income- less than $25,000, between $25,000 and $50,000, between $50,000 and $75,000, between $75,000 and $100,000, between $100,000 and $150,000, between $150,000 and $200,000, more than $200,000, or do you not care to say?

Less than $25,000	15%
$25,000-$50,000	18%
$50,000-$75,000	11%
$75,000-$100,000	9%
$100,000-$150,000	10%
$150,000-$200,000	5%
More than $200,000	6%
Don't care to say	26%

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Q19 Mode

Landline 48%

Text 52%

Q20 Media Market

Erie 3%

Harrisburg 15%

Johnstown..... 6%

Philadelphia 41%

Pittsburgh.....22%

Scranton 11%

Other..... 2%

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	Base	Gender		
		Woman	Man	Gender non-binary
Primary Home Internet Service Type				
Telephone line or dial-up	**12%**	14%	11%	5%
DSL or digital subscriber line	**10%**	10%	10%	8%
Cable modem internet	**44%**	45%	45%	13%
Satellite internet	**3%**	2%	4%	17%
Cellular or mobile phone internet	**9%**	10%	7%	5%
Fiber-optic connection	**11%**	9%	14%	12%
Something else	**3%**	3%	3%	16%
I do not have home internet service	**8%**	8%	7%	24%

	Base	Gender		
		Woman	Man	Gender non-binary
Household Internet Service Cost Per Month				
Less than $20 per month	**8%**	10%	5%	25%
$21-$40 per month	**12%**	10%	14%	1%
$41-$60 per month	**19%**	18%	19%	15%
$61-$80 per month	**17%**	13%	21%	23%
$81-$100 per month	**14%**	14%	13%	14%
$101-$120 per month	**7%**	7%	7%	5%
More than $120 per month	**13%**	16%	9%	10%
I have free home internet service	**1%**	1%	1%	6%
Not sure	**11%**	12%	11%	1%

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	Base	Gender		
		Woman	Man	Gender non-binary
Internet Service Part Of Bundled Package Yes / No				
Yes	**57%**	62%	53%	27%
No	**35%**	30%	40%	48%
Not sure	**8%**	8%	7%	25%

	Base	Gender		
		Woman	Man	Gender non-binary
Download Speed Of Current Home Internet Service				
0-10 megabits per second	**10%**	11%	10%	17%
10-25 megabits per second	**11%**	8%	13%	8%
25-100 megabits per second	**19%**	14%	23%	31%
More than 100 megabits per second	**16%**	13%	21%	4%
Not sure	**44%**	54%	33%	40%

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	Base	Gender		
		Woman	Man	Gender non-binary
Level Of Interest In 25 Megabits Per Second Free Service				
Very interested	**26%**	25%	27%	21%
Somewhat interested	**17%**	14%	21%	-
Not that interested	**12%**	13%	10%	35%
Not interested at all	**31%**	32%	30%	33%
Not sure	**13%**	15%	12%	10%

	Base	Gender		
		Woman	Man	Gender non-binary
Level Of Interest In 25 Megabits Internet Service At Less Than $20 Per Month				
Very interested	**20%**	18%	21%	21%
Somewhat interested	**17%**	16%	18%	14%
Not that interested	**15%**	15%	14%	20%
Not interested at all	**36%**	37%	34%	35%
Not sure	**13%**	14%	12%	9%

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	Base	Gender		
		Woman	Man	Gender non-binary
Level Of Interest In 25 Megabits Internet Service At $21-$40 Per Month				
Very interested	**9%**	9%	10%	4%
Somewhat interested	**15%**	13%	17%	20%
Not that interested	**17%**	17%	17%	19%
Not interested at all	**46%**	47%	45%	51%
Not sure	**13%**	14%	11%	7%

	Base	Gender		
		Woman	Man	Gender non-binary
Level Of Interest In 25 Megabits Internet Service At $41-$60 Per Month				
Very interested	**5%**	5%	5%	9%
Somewhat interested	**9%**	9%	9%	10%
Not that interested	**17%**	16%	19%	21%
Not interested at all	**55%**	55%	55%	46%
Not sure	**14%**	15%	12%	14%

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	Base	Gender		
		Woman	Man	Gender non-binary
Level Of Interest In 25 Megabits Internet Service At $61-$80 Per Month				
Very interested	**3%**	4%	1%	9%
Somewhat interested	**5%**	5%	5%	4%
Not that interested	**14%**	12%	16%	26%
Not interested at all	**65%**	65%	65%	47%
Not sure	**14%**	14%	14%	14%

	Base	Gender		
		Woman	Man	Gender non-binary
Level Of Interest In 25 Megabits Internet Service At $81-$100 Per Month				
Very interested	**2%**	3%	1%	9%
Somewhat interested	**3%**	4%	3%	4%
Not that interested	**11%**	11%	10%	21%
Not interested at all	**71%**	69%	73%	55%
Not sure	**13%**	13%	13%	12%

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	Base	Gender		
		Woman	Man	Gender non-binary
Level Of Interest In 25 Megabits Internet Service At $101-$120 Per Month				
Very interested	**2%**	3%	1%	9%
Somewhat interested	**2%**	2%	2%	4%
Not that interested	**9%**	10%	7%	21%
Not interested at all	**75%**	72%	79%	55%
Not sure	**13%**	13%	12%	12%

	Base	Gender		
		Woman	Man	Gender non-binary
Level Of Interest In 25 Megabits Internet Service At More Than $120 Per Month				
Very interested	**2%**	3%	1%	10%
Somewhat interested	**2%**	2%	2%	-
Not that interested	**7%**	9%	5%	22%
Not interested at all	**76%**	74%	79%	57%
Not sure	**13%**	13%	13%	11%

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	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or Africa-n-American	American India-n or Alaska N...	Othe-r
Primary Home Internet Service Type							
Telephone line or dial-up	**12%**	25%	12%	5%	6%	22%	13%
DSL or digital subscriber line	**10%**	8%	11%	3%	7%	-	7%
Cable modem internet	**44%**	48%	44%	28%	55%	75%	28%
Satellite internet	**3%**	2%	3%	16%	6%	-	-
Cellular or mobile phone internet	**9%**	6%	6%	37%	11%	3%	18%
Fiber-optic connection	**11%**	8%	12%	10%	8%	-	7%
Something else	**3%**	-	2%	1%	4%	-	9%
I do not have home internet service	**8%**	4%	8%	0%	4%	-	17%

	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or Africa-n-American	American India-n or Alaska N...	Othe-r
Household Internet Service Cost Per Month							
Less than $20 per month	**8%**	34%	5%	-	12%	3%	12%
$21-$40 per month	**12%**	3%	11%	8%	19%	-	12%
$41-$60 per month	**19%**	11%	20%	7%	16%	5%	32%
$61-$80 per month	**17%**	11%	19%	15%	10%	57%	3%
$81-$100 per month	**14%**	12%	15%	19%	10%	25%	3%
$101-$120 per month	**7%**	3%	6%	-	8%	11%	18%
More than $120 per month	**13%**	22%	12%	10%	15%	-	9%
I have free home internet service	**1%**	2%	1%	4%	1%	-	0%
Not sure	**11%**	4%	11%	35%	8%	-	10%

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	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or African-American	American Indian or Alaska N...	Other
Internet Service Part Of Bundled Package Yes / No							
Yes	**57%**	67%	58%	45%	58%	54%	44%
No	**35%**	33%	34%	35%	39%	46%	32%
Not sure	**8%**	-	7%	20%	4%	-	24%

	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or African-American	American Indian or Alaska N...	Other
Download Speed Of Current Home Internet Service							
0-10 megabits per second	**10%**	22%	10%	2%	10%	-	13%
10-25 megabits per second	**11%**	5%	10%	16%	15%	2%	4%
25-100 megabits per second	**19%**	19%	20%	18%	11%	10%	22%
More than 100 megabits per second	**16%**	29%	15%	19%	16%	56%	13%
Not sure	**44%**	24%	45%	45%	47%	32%	48%

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	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or Africa-n-American	American India-n or Alaska N...	Othe-r
Level Of Interest In 25 Megabits Per Second Free Service							
Very interested	**26%**	37%	27%	13%	27%	-	18%
Somewhat interested	**17%**	18%	18%	11%	14%	35%	19%
Not that interested	**12%**	5%	12%	28%	11%	-	18%
Not interested at all	**31%**	34%	32%	14%	31%	62%	30%
Not sure	**13%**	7%	12%	36%	16%	3%	15%

	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or Africa-n-American	American India-n or Alaska N...	Othe-r
Level Of Interest In 25 Megabits Internet Service At Less Than $20 Per Month							
Very interested	**20%**	31%	20%	11%	20%	-	13%
Somewhat interested	**17%**	13%	18%	9%	14%	13%	14%
Not that interested	**15%**	12%	14%	16%	20%	22%	19%
Not interested at all	**36%**	41%	36%	27%	32%	62%	36%
Not sure	**13%**	4%	12%	37%	14%	3%	17%

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	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or Africa-n-American	American India-n or Alaska N...	Othe-r
Level Of Interest In 25 Megabits Internet Service At $21-$40 Per Month							
Very interested	**9%**	26%	9%	1%	9%	-	3%
Somewhat interested	**15%**	13%	16%	14%	13%	5%	15%
Not that interested	**17%**	8%	17%	19%	24%	25%	14%
Not interested at all	**46%**	48%	46%	36%	41%	68%	56%
Not sure	**13%**	5%	12%	30%	14%	3%	12%

	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or Africa-n-American	American India-n or Alaska N...	Othe-r
Level Of Interest In 25 Megabits Internet Service At $41-$60 Per Month							
Very interested	**5%**	24%	5%	-	2%	-	4%
Somewhat interested	**9%**	8%	8%	6%	19%	-	6%
Not that interested	**17%**	13%	17%	22%	24%	7%	13%
Not interested at all	**55%**	51%	57%	39%	42%	90%	57%
Not sure	**14%**	4%	13%	32%	12%	3%	20%

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	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or African-American	American Indian or Alaska N...	Other
Level Of Interest In 25 Megabits Internet Service At $61-$80 Per Month							
Very interested	**3%**	24%	1%	-	1%	-	4%
Somewhat interested	**5%**	1%	4%	5%	8%	-	5%
Not that interested	**14%**	15%	12%	16%	27%	3%	10%
Not interested at all	**65%**	56%	69%	44%	47%	94%	61%
Not sure	**14%**	4%	13%	35%	17%	3%	21%

	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or African-American	American Indian or Alaska N...	Other
Level Of Interest In 25 Megabits Internet Service At $81-$100 Per Month							
Very interested	**2%**	18%	1%	-	1%	-	3%
Somewhat interested	**3%**	7%	2%	3%	9%	-	2%
Not that interested	**11%**	11%	9%	21%	22%	3%	10%
Not interested at all	**71%**	61%	77%	41%	52%	72%	68%
Not sure	**13%**	3%	11%	35%	17%	25%	17%

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	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or African-American	American Indian or Alaska N...	Other
Level Of Interest In 25 Megabits Internet Service At $101-$120 Per Month							
Very interested	**2%**	17%	1%	-	1%	-	3%
Somewhat interested	**2%**	6%	2%	-	2%	-	-
Not that interested	**9%**	10%	6%	21%	19%	3%	8%
Not interested at all	**75%**	63%	80%	45%	61%	94%	72%
Not sure	**13%**	4%	11%	34%	16%	3%	18%

	Base	Race					
		Hispanic or Lati...	White	Asian or Pacific Islander	Black or African-American	American Indian or Alaska N...	Other
Level Of Interest In 25 Megabits Internet Service At More Than $120 Per Month							
Very interested	**2%**	23%	1%	-	1%	-	3%
Somewhat interested	**2%**	6%	2%	-	3%	-	2%
Not that interested	**7%**	6%	6%	20%	17%	3%	6%
Not interested at all	**76%**	62%	81%	47%	64%	94%	71%
Not sure	**13%**	3%	12%	33%	16%	3%	18%

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	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Primary Home Internet Service Type						
Telephone line or dial-up	**12%**	8%	6%	7%	10%	27%
DSL or digital subscriber line	**10%**	5%	14%	7%	14%	10%
Cable modem internet	**44%**	50%	55%	48%	45%	28%
Satellite internet	**3%**	2%	1%	6%	3%	5%
Cellular or mobile phone internet	**9%**	13%	8%	8%	10%	5%
Fiber-optic connection	**11%**	13%	14%	14%	8%	7%
Something else	**3%**	3%	1%	6%	1%	2%
I do not have home internet service	**8%**	5%	2%	5%	7%	16%

	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Household Internet Service Cost Per Month						
Less than $20 per month	**8%**	13%	3%	5%	6%	9%
$21-$40 per month	**12%**	13%	11%	10%	9%	16%
$41-$60 per month	**19%**	16%	19%	19%	20%	19%
$61-$80 per month	**17%**	16%	18%	22%	13%	16%
$81-$100 per month	**14%**	14%	16%	12%	18%	9%
$101-$120 per month	**7%**	5%	14%	7%	4%	6%
More than $120 per month	**13%**	8%	11%	13%	20%	12%
I have free home internet service	**1%**	0%	2%	1%	0%	3%
Not sure	**11%**	16%	6%	12%	10%	9%

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	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Internet Service Part Of Bundled Package Yes / No						
Yes	**57%**	43%	51%	60%	68%	67%
No	**35%**	46%	45%	35%	25%	21%
Not sure	**8%**	11%	4%	4%	7%	12%

	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Download Speed Of Current Home Internet Service						
0-10 megabits per second	**10%**	12%	8%	11%	9%	11%
10-25 megabits per second	**11%**	12%	11%	12%	8%	9%
25-100 megabits per second	**19%**	24%	22%	18%	15%	13%
More than 100 megabits per second	**16%**	20%	26%	20%	11%	5%
Not sure	**44%**	31%	33%	39%	57%	61%

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	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Level Of Interest In 25 Megabits Per Second Free Service						
Very interested	**26%**	23%	19%	29%	32%	28%
Somewhat interested	**17%**	16%	29%	15%	16%	13%
Not that interested	**12%**	12%	10%	13%	12%	14%
Not interested at all	**31%**	29%	29%	31%	29%	37%
Not sure	**13%**	20%	14%	12%	12%	8%

	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Level Of Interest In 25 Megabits Internet Service At Less Than $20 Per Month						
Very interested	**20%**	20%	18%	18%	24%	18%
Somewhat interested	**17%**	12%	23%	18%	16%	16%
Not that interested	**15%**	14%	12%	16%	14%	16%
Not interested at all	**36%**	35%	33%	32%	35%	42%
Not sure	**13%**	19%	13%	15%	11%	7%

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	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Level Of Interest In 25 Megabits Internet Service At $21-$40 Per Month						
Very interested	**9%**	8%	10%	10%	11%	7%
Somewhat interested	**15%**	16%	21%	15%	14%	12%
Not that interested	**17%**	12%	13%	21%	17%	21%
Not interested at all	**46%**	44%	45%	42%	46%	53%
Not sure	**13%**	19%	10%	13%	12%	7%

	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Level Of Interest In 25 Megabits Internet Service At $41-$60 Per Month						
Very interested	**5%**	8%	5%	3%	7%	3%
Somewhat interested	**9%**	8%	13%	9%	7%	10%
Not that interested	**17%**	11%	18%	24%	15%	21%
Not interested at all	**55%**	55%	52%	49%	56%	60%
Not sure	**14%**	19%	12%	15%	15%	6%

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	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Level Of Interest In 25 Megabits Internet Service At $61-$80 Per Month						
Very interested	**3%**	7%	2%	1%	3%	0%
Somewhat interested	**5%**	5%	6%	2%	6%	3%
Not that interested	**14%**	7%	13%	24%	10%	19%
Not interested at all	**65%**	60%	67%	60%	67%	70%
Not sure	**14%**	21%	13%	14%	13%	7%

	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Level Of Interest In 25 Megabits Internet Service At $81-$100 Per Month						
Very interested	**2%**	5%	1%	0%	2%	-
Somewhat interested	**3%**	6%	5%	0%	4%	2%
Not that interested	**11%**	6%	9%	19%	9%	12%
Not interested at all	**71%**	63%	74%	67%	73%	79%
Not sure	**13%**	21%	11%	13%	13%	6%

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	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Level Of Interest In 25 Megabits Internet Service At $101-$120 Per Month						
Very interested	**2%**	5%	1%	0%	1%	0%
Somewhat interested	**2%**	1%	4%	0%	2%	2%
Not that interested	**9%**	5%	7%	17%	7%	8%
Not interested at all	**75%**	69%	77%	69%	76%	84%
Not sure	**13%**	20%	10%	13%	14%	6%

	Base	Age				
		18 to 34	35 to 44	45 to 54	55 to 64	65 years or ol...
Level Of Interest In 25 Megabits Internet Service At More Than $120 Per Month						
Very interested	**2%**	6%	1%	1%	1%	1%
Somewhat interested	**2%**	2%	4%	1%	2%	2%
Not that interested	**7%**	5%	4%	16%	6%	7%
Not interested at all	**76%**	68%	81%	69%	79%	83%
Not sure	**13%**	19%	10%	13%	12%	7%

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	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Primary Home Internet Service Type				
Telephone line or dial-up	**12%**	12%	7%	19%
DSL or digital subscriber line	**10%**	3%	9%	16%
Cable modem internet	**44%**	48%	50%	34%
Satellite internet	**3%**	2%	2%	7%
Cellular or mobile phone internet	**9%**	8%	9%	9%
Fiber-optic connection	**11%**	14%	17%	1%
Something else	**3%**	3%	2%	4%
I do not have home internet service	**8%**	9%	4%	11%

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	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Household Internet Service Cost Per Month				
Less than $20 per month	**8%**	15%	3%	8%
$21-$40 per month	**12%**	12%	9%	16%
$41-$60 per month	**19%**	16%	18%	21%
$61-$80 per month	**17%**	13%	20%	15%
$81-$100 per month	**14%**	12%	12%	17%
$101-$120 per month	**7%**	7%	7%	7%
More than $120 per month	**13%**	15%	15%	8%
I have free home internet service	**1%**	2%	1%	1%
Not sure	**11%**	9%	15%	7%

	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Internet Service Part Of Bundled Package Yes / No				
Yes	**57%**	57%	60%	54%
No	**35%**	35%	32%	39%
Not sure	**8%**	9%	8%	7%

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	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Download Speed Of Current Home Internet Service				
0-10 megabits per second	**10%**	9%	5%	19%
10-25 megabits per second	**11%**	12%	9%	12%
25-100 megabits per second	**19%**	16%	21%	17%
More than 100 megabits per second	**16%**	24%	17%	9%
Not sure	**44%**	40%	47%	43%

	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Level Of Interest In 25 Megabits Per Second Free Service				
Very interested	**26%**	28%	18%	34%
Somewhat interested	**17%**	17%	21%	13%
Not that interested	**12%**	11%	12%	13%
Not interested at all	**31%**	32%	31%	31%
Not sure	**13%**	13%	18%	8%

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	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Level Of Interest In 25 Megabits Internet Service At Less Than $20 Per Month				
Very interested	**20%**	20%	14%	27%
Somewhat interested	**17%**	13%	20%	15%
Not that interested	**15%**	19%	13%	13%
Not interested at all	**36%**	34%	36%	36%
Not sure	**13%**	14%	17%	8%

	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Level Of Interest In 25 Megabits Internet Service At $21-$40 Per Month				
Very interested	**9%**	11%	5%	13%
Somewhat interested	**15%**	13%	17%	14%
Not that interested	**17%**	17%	15%	19%
Not interested at all	**46%**	47%	45%	47%
Not sure	**13%**	12%	17%	8%

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	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Level Of Interest In 25 Megabits Internet Service At $41-$60 Per Month				
Very interested	**5%**	7%	2%	7%
Somewhat interested	**9%**	10%	10%	8%
Not that interested	**17%**	17%	17%	19%
Not interested at all	**55%**	55%	54%	56%
Not sure	**14%**	12%	17%	10%

	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Level Of Interest In 25 Megabits Internet Service At $61-$80 Per Month				
Very interested	**3%**	6%	1%	2%
Somewhat interested	**5%**	5%	5%	5%
Not that interested	**14%**	13%	15%	14%
Not interested at all	**65%**	64%	60%	70%
Not sure	**14%**	12%	19%	9%

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	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Level Of Interest In 25 Megabits Internet Service At $81-$100 Per Month				
Very interested	**2%**	5%	1%	1%
Somewhat interested	**3%**	5%	3%	3%
Not that interested	**11%**	14%	9%	11%
Not interested at all	**71%**	64%	70%	77%
Not sure	**13%**	12%	17%	8%

	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Level Of Interest In 25 Megabits Internet Service At $101-$120 Per Month				
Very interested	**2%**	5%	1%	1%
Somewhat interested	**2%**	2%	2%	1%
Not that interested	**9%**	11%	7%	9%
Not interested at all	**75%**	71%	73%	80%
Not sure	**13%**	10%	17%	9%

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	Base	Urban / Suburban / Rural Area		
		Urban ar...	Suburban area	Rural a...
Level Of Interest In 25 Megabits Internet Service At More Than $120 Per Month				
Very interested	**2%**	6%	1%	1%
Somewhat interested	**2%**	2%	2%	1%
Not that interested	**7%**	10%	6%	8%
Not interested at all	**76%**	71%	74%	81%
Not sure	**13%**	11%	17%	8%

	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Primary Home Internet Service Type								
Telephone line or dial-up	**12%**	24%	17%	12%	10%	4%	4%	10%
DSL or digital subscriber line	**10%**	8%	11%	8%	15%	10%	8%	8%
Cable modem internet	**44%**	23%	41%	46%	47%	50%	60%	31%
Satellite internet	**3%**	7%	3%	5%	0%	4%	2%	8%
Cellular or mobile phone internet	**9%**	7%	13%	10%	13%	3%	3%	4%
Fiber-optic connection	**11%**	8%	4%	11%	9%	23%	19%	7%
Something else	**3%**	12%	2%	2%	3%	2%	1%	7%
I do not have home internet service	**8%**	11%	9%	6%	3%	3%	4%	25%

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	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Household Internet Service Cost Per Month								
Less than $20 per month	**8%**	33%	9%	9%	4%	2%	2%	2%
$21-$40 per month	**12%**	6%	17%	13%	11%	8%	6%	8%
$41-$60 per month	**19%**	13%	18%	22%	14%	20%	23%	8%
$61-$80 per month	**17%**	9%	14%	17%	15%	23%	15%	28%
$81-$100 per month	**14%**	5%	9%	14%	20%	18%	17%	13%
$101-$120 per month	**7%**	-	5%	7%	10%	8%	11%	10%
More than $120 per month	**13%**	14%	11%	11%	15%	13%	17%	14%
I have free home internet service	**1%**	2%	1%	1%	1%	2%	1%	2%
Not sure	**11%**	17%	15%	7%	10%	7%	8%	15%

	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Internet Service Part Of Bundled Package Yes / No								
Yes	**57%**	54%	60%	49%	64%	55%	61%	61%
No	**35%**	24%	31%	43%	30%	41%	37%	28%
Not sure	**8%**	22%	9%	8%	6%	4%	2%	11%

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	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Download Speed Of Current Home Internet Service								
0-10 megabits per second	**10%**	26%	15%	9%	7%	7%	2%	2%
10-25 megabits per second	**11%**	20%	13%	10%	8%	7%	9%	5%
25-100 megabits per second	**19%**	-	13%	22%	26%	27%	21%	16%
More than 100 megabits per second	**16%**	17%	6%	17%	20%	23%	27%	27%
Not sure	**44%**	37%	52%	42%	39%	36%	42%	49%

	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Level Of Interest In 25 Megabits Per Second Free Service								
Very interested	**26%**	34%	26%	24%	29%	25%	26%	26%
Somewhat interested	**17%**	15%	13%	22%	19%	21%	19%	15%
Not that interested	**12%**	10%	12%	12%	8%	13%	14%	11%
Not interested at all	**31%**	35%	32%	28%	32%	27%	29%	44%
Not sure	**13%**	6%	16%	14%	11%	13%	13%	3%

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	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Level Of Interest In 25 Megabits Internet Service At Less Than $20 Per Month								
Very interested	**20%**	26%	22%	17%	19%	19%	16%	17%
Somewhat interested	**17%**	12%	13%	22%	23%	16%	18%	23%
Not that interested	**15%**	22%	14%	12%	13%	17%	17%	11%
Not interested at all	**36%**	41%	36%	33%	34%	34%	36%	45%
Not sure	**13%**	-	15%	17%	11%	13%	13%	3%

	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $21-$40 Per Month								
Very interested	**9%**	24%	9%	6%	10%	7%	9%	12%
Somewhat interested	**15%**	10%	14%	16%	18%	18%	15%	15%
Not that interested	**17%**	22%	15%	18%	13%	18%	19%	13%
Not interested at all	**46%**	44%	48%	42%	48%	45%	44%	52%
Not sure	**13%**	-	13%	18%	11%	12%	13%	8%

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	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $41-$60 Per Month								
Very interested	**5%**	17%	5%	2%	7%	4%	4%	5%
Somewhat interested	**9%**	10%	9%	9%	8%	8%	8%	13%
Not that interested	**17%**	29%	14%	17%	17%	19%	20%	15%
Not interested at all	**55%**	44%	56%	54%	55%	55%	54%	63%
Not sure	**14%**	-	16%	18%	12%	14%	13%	3%

	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $61-$80 Per Month								
Very interested	**3%**	17%	2%	2%	2%	1%	1%	4%
Somewhat interested	**5%**	1%	6%	5%	3%	5%	3%	-
Not that interested	**14%**	17%	10%	15%	17%	15%	18%	21%
Not interested at all	**65%**	64%	65%	59%	65%	66%	65%	72%
Not sure	**14%**	-	16%	18%	13%	14%	13%	3%

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	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $81-$100 Per Month								
Very interested	**2%**	17%	1%	0%	2%	1%	0%	4%
Somewhat interested	**3%**	1%	6%	1%	-	3%	2%	-
Not that interested	**11%**	14%	8%	10%	11%	11%	14%	19%
Not interested at all	**71%**	67%	68%	73%	74%	72%	71%	74%
Not sure	**13%**	-	16%	16%	12%	13%	12%	3%

	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $101-$120 Per Month								
Very interested	**2%**	17%	1%	0%	2%	0%	-	4%
Somewhat interested	**2%**	1%	4%	1%	-	1%	1%	-
Not that interested	**9%**	10%	6%	8%	9%	9%	13%	16%
Not interested at all	**75%**	71%	72%	76%	76%	79%	75%	77%
Not sure	**13%**	-	16%	15%	13%	10%	11%	3%

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	Base	Education						
		Some high school but did not fi...	High school graduate	Some college but did not finish	2-year college degree	4-year college degree	Post-graduate degree	Don't care to say
Level Of Interest In 25 Megabits Internet Service At More Than $120 Per Month								
Very interested	**2%**	21%	1%	2%	2%	1%	-	4%
Somewhat interested	**2%**	-	4%	1%	-	1%	1%	-
Not that interested	**7%**	10%	7%	6%	7%	6%	9%	16%
Not interested at all	**76%**	68%	72%	76%	78%	82%	78%	77%
Not sure	**13%**	1%	17%	15%	13%	10%	12%	3%

	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Primary Home Internet Service Type									
Telephone line or dial-up	**12%**	23%	14%	7%	5%	0%	5%	4%	17%
DSL or digital subscriber line	**10%**	11%	13%	9%	9%	6%	10%	7%	10%
Cable modem internet	**44%**	29%	40%	52%	55%	62%	61%	57%	37%
Satellite internet	**3%**	2%	5%	3%	1%	5%	4%	1%	4%
Cellular or mobile phone internet	**9%**	11%	11%	8%	6%	5%	5%	4%	11%
Fiber-optic connection	**11%**	4%	6%	17%	17%	20%	14%	23%	8%
Something else	**3%**	5%	3%	1%	1%	1%	0%	-	5%
I do not have home internet service	**8%**	15%	7%	4%	6%	2%	-	5%	10%

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	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Household Internet Service Cost Per Month									
Less than $20 per month	**8%**	32%	6%	3%	3%	1%	3%	0%	5%
$21-$40 per month	**12%**	11%	24%	10%	14%	5%	8%	2%	9%
$41-$60 per month	**19%**	9%	21%	24%	16%	23%	13%	24%	18%
$61-$80 per month	**17%**	14%	15%	22%	22%	19%	23%	14%	13%
$81-$100 per month	**14%**	8%	9%	15%	19%	20%	22%	14%	12%
$101-$120 per month	**7%**	6%	4%	6%	8%	15%	7%	9%	5%
More than $120 per month	**13%**	14%	10%	11%	12%	10%	18%	13%	14%
I have free home internet service	**1%**	1%	3%	-	-	1%	-	4%	1%
Not sure	**11%**	5%	7%	7%	5%	6%	5%	19%	22%

	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Internet Service Part Of Bundled Package Yes / No									
Yes	**57%**	41%	55%	58%	53%	58%	60%	64%	66%
No	**35%**	45%	39%	37%	45%	40%	35%	27%	22%
Not sure	**8%**	14%	6%	5%	1%	2%	5%	9%	12%

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	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Download Speed Of Current Home Internet Service									
0-10 megabits per second	**10%**	24%	15%	7%	9%	6%	7%	1%	6%
10-25 megabits per second	**11%**	9%	17%	13%	9%	12%	1%	10%	8%
25-100 megabits per second	**19%**	12%	15%	29%	30%	27%	23%	20%	10%
More than 100 megabits per second	**16%**	8%	9%	17%	21%	23%	32%	29%	15%
Not sure	**44%**	47%	43%	33%	31%	32%	36%	40%	60%

	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Level Of Interest In 25 Megabits Per Second Free Service									
Very interested	**26%**	39%	27%	31%	30%	26%	20%	14%	19%
Somewhat interested	**17%**	9%	25%	18%	23%	22%	24%	20%	11%
Not that interested	**12%**	9%	8%	12%	11%	14%	12%	23%	14%
Not interested at all	**31%**	30%	31%	28%	27%	27%	26%	27%	39%
Not sure	**13%**	13%	10%	12%	9%	11%	19%	16%	18%

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	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Level Of Interest In 25 Megabits Internet Service At Less Than $20 Per Month									
Very interested	**20%**	29%	25%	16%	24%	23%	17%	4%	14%
Somewhat interested	**17%**	11%	23%	22%	22%	21%	12%	14%	12%
Not that interested	**15%**	16%	9%	18%	11%	13%	24%	31%	14%
Not interested at all	**36%**	33%	36%	28%	32%	32%	31%	34%	44%
Not sure	**13%**	11%	7%	17%	10%	11%	16%	17%	17%

	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $21-$40 Per Month									
Very interested	**9%**	17%	7%	9%	10%	11%	12%	4%	7%
Somewhat interested	**15%**	10%	21%	21%	20%	14%	16%	16%	10%
Not that interested	**17%**	18%	17%	17%	15%	23%	18%	12%	15%
Not interested at all	**46%**	47%	45%	40%	45%	41%	38%	53%	51%
Not sure	**13%**	8%	9%	14%	10%	10%	16%	15%	17%

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	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $41-$60 Per Month									
Very interested	**5%**	10%	4%	5%	6%	4%	11%	4%	3%
Somewhat interested	**9%**	12%	10%	10%	13%	11%	4%	13%	4%
Not that interested	**17%**	16%	19%	16%	17%	21%	23%	13%	17%
Not interested at all	**55%**	50%	58%	52%	55%	51%	47%	53%	59%
Not sure	**14%**	11%	9%	17%	10%	13%	15%	17%	17%

	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $61-$80 Per Month									
Very interested	**3%**	10%	1%	2%	3%	2%	1%	3%	1%
Somewhat interested	**5%**	2%	6%	5%	6%	7%	11%	10%	1%
Not that interested	**14%**	14%	13%	16%	14%	19%	15%	6%	14%
Not interested at all	**65%**	64%	68%	60%	68%	59%	54%	64%	67%
Not sure	**14%**	10%	12%	17%	9%	13%	18%	16%	17%

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	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $81-$100 Per Month									
Very interested	**2%**	8%	1%	-	1%	1%	1%	3%	1%
Somewhat interested	**3%**	5%	4%	1%	5%	2%	7%	10%	1%
Not that interested	**11%**	12%	8%	12%	13%	16%	17%	4%	11%
Not interested at all	**71%**	66%	76%	71%	73%	68%	59%	64%	74%
Not sure	**13%**	10%	11%	16%	8%	13%	16%	19%	14%

	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Level Of Interest In 25 Megabits Internet Service At $101-$120 Per Month									
Very interested	**2%**	8%	1%	-	-	-	1%	3%	1%
Somewhat interested	**2%**	3%	3%	0%	3%	3%	0%	0%	1%
Not that interested	**9%**	10%	4%	9%	10%	13%	17%	1%	9%
Not interested at all	**75%**	68%	80%	73%	80%	71%	66%	80%	76%
Not sure	**13%**	11%	11%	17%	8%	13%	16%	16%	13%

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	Base	Income							
		Less than $25,000	$25,000-$50,...	$50,000-$75,...	$75,000-$100,0...	$100,000-$150,...	$150,000-$200,...	More than $200,...	Don't care to say
Level Of Interest In 25 Megabits Internet Service At More Than $120 Per Month									
Very interested	**2%**	9%	-	-	1%	-	1%	3%	2%
Somewhat interested	**2%**	4%	3%	-	2%	3%	0%	-	1%
Not that interested	**7%**	10%	3%	9%	8%	7%	10%	3%	9%
Not interested at all	**76%**	68%	83%	74%	81%	76%	70%	79%	75%
Not sure	**13%**	10%	10%	17%	8%	14%	18%	16%	14%

	Base	Mode	
		Landli...	Text
Primary Home Internet Service Type			
Telephone line or dial-up	**12%**	23%	2%
DSL or digital subscriber line	**10%**	14%	6%
Cable modem internet	**44%**	32%	56%
Satellite internet	**3%**	5%	2%
Cellular or mobile phone internet	**9%**	3%	14%
Fiber-optic connection	**11%**	8%	14%
Something else	**3%**	3%	3%
I do not have home internet service	**8%**	11%	4%

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	Base	Mode	
		Landli...	Text
Household Internet Service Cost Per Month			
Less than $20 per month	**8%**	9%	6%
$21-$40 per month	**12%**	18%	7%
$41-$60 per month	**19%**	22%	15%
$61-$80 per month	**17%**	16%	17%
$81-$100 per month	**14%**	12%	15%
$101-$120 per month	**7%**	5%	9%
More than $120 per month	**13%**	12%	13%
I have free home internet service	**1%**	1%	1%
Not sure	**11%**	4%	17%

	Base	Mode	
		Landli...	Text
Internet Service Part Of Bundled Package Yes / No			
Yes	**57%**	68%	48%
No	**35%**	25%	44%
Not sure	**8%**	8%	8%

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	Base	Mode	
		Landli...	Text
Download Speed Of Current Home Internet Service			
0-10 megabits per second	**10%**	18%	4%
10-25 megabits per second	**11%**	12%	10%
25-100 megabits per second	**19%**	13%	23%
More than 100 megabits per second	**16%**	12%	20%
Not sure	**44%**	45%	43%

	Base	Mode	
		Landli...	Text
Level Of Interest In 25 Megabits Per Second Free Service			
Very interested	**26%**	29%	24%
Somewhat interested	**17%**	15%	19%
Not that interested	**12%**	16%	9%
Not interested at all	**31%**	36%	27%
Not sure	**13%**	4%	22%

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	Base	Mode	
		Landli...	Text
Level Of Interest In 25 Megabits Internet Service At Less Than $20 Per Month			
Very interested	**20%**	21%	19%
Somewhat interested	**17%**	18%	16%
Not that interested	**15%**	18%	12%
Not interested at all	**36%**	41%	31%
Not sure	**13%**	3%	22%

	Base	Mode	
		Landli...	Text
Level Of Interest In 25 Megabits Internet Service At $21-$40 Per Month			
Very interested	**9%**	10%	8%
Somewhat interested	**15%**	13%	17%
Not that interested	**17%**	20%	14%
Not interested at all	**46%**	53%	39%
Not sure	**13%**	3%	21%

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	Base	Mode	
		Landli...	Text
Level Of Interest In 25 Megabits Internet Service At $41-$60 Per Month			
Very interested	**5%**	7%	4%
Somewhat interested	**9%**	8%	10%
Not that interested	**17%**	19%	16%
Not interested at all	**55%**	61%	48%
Not sure	**14%**	5%	21%

	Base	Mode	
		Landli...	Text
Level Of Interest In 25 Megabits Internet Service At $61-$80 Per Month			
Very interested	**3%**	4%	2%
Somewhat interested	**5%**	5%	4%
Not that interested	**14%**	15%	14%
Not interested at all	**65%**	70%	60%
Not sure	**14%**	6%	21%

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	Base	Mode	
		Landli...	Text
Level Of Interest In 25 Megabits Internet Service At $81-$100 Per Month			
Very interested	**2%**	3%	1%
Somewhat interested	**3%**	4%	3%
Not that interested	**11%**	9%	12%
Not interested at all	**71%**	78%	64%
Not sure	**13%**	5%	20%

	Base	Mode	
		Landli...	Text
Level Of Interest In 25 Megabits Internet Service At $101-$120 Per Month			
Very interested	**2%**	3%	0%
Somewhat interested	**2%**	2%	2%
Not that interested	**9%**	7%	11%
Not interested at all	**75%**	82%	68%
Not sure	**13%**	6%	19%

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	Base	Mode	
		Landli...	Text
Level Of Interest In 25 Megabits Internet Service At More Than $120 Per Month			
Very interested	**2%**	4%	1%
Somewhat interested	**2%**	2%	2%
Not that interested	**7%**	7%	8%
Not interested at all	**76%**	82%	70%
Not sure	**13%**	5%	19%

	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Primary Home Internet Service Type								
Telephone line or dial-up	**12%**	17%	10%	19%	7%	14%	21%	23%
DSL or digital subscriber line	**10%**	5%	13%	20%	6%	9%	15%	16%
Cable modem internet	**44%**	39%	45%	36%	51%	39%	39%	38%
Satellite internet	**3%**	11%	2%	8%	2%	5%	4%	1%
Cellular or mobile phone internet	**9%**	10%	8%	4%	10%	8%	8%	9%
Fiber-optic connection	**11%**	4%	5%	-	15%	18%	1%	3%
Something else	**3%**	6%	4%	4%	2%	3%	1%	3%
I do not have home internet service	**8%**	8%	12%	9%	7%	4%	10%	6%

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	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Household Internet Service Cost Per Month								
Less than $20 per month	**8%**	6%	7%	1%	8%	11%	4%	7%
$21-$40 per month	**12%**	7%	8%	21%	11%	13%	13%	9%
$41-$60 per month	**19%**	26%	21%	22%	14%	22%	23%	22%
$61-$80 per month	**17%**	26%	14%	18%	17%	14%	18%	27%
$81-$100 per month	**14%**	15%	19%	22%	11%	11%	14%	17%
$101-$120 per month	**7%**	2%	6%	7%	7%	8%	5%	8%
More than $120 per month	**13%**	9%	10%	8%	16%	11%	13%	5%
I have free home internet service	**1%**	3%	2%	-	0%	2%	3%	-
Not sure	**11%**	7%	13%	1%	15%	8%	6%	5%

	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Internet Service Part Of Bundled Package Yes / No								
Yes	**57%**	55%	56%	62%	62%	55%	48%	40%
No	**35%**	41%	34%	32%	32%	36%	44%	51%
Not sure	**8%**	4%	10%	6%	7%	9%	8%	10%

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	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Download Speed Of Current Home Internet Service								
0-10 megabits per second	**10%**	9%	16%	18%	4%	14%	15%	15%
10-25 megabits per second	**11%**	18%	11%	14%	11%	10%	8%	6%
25-100 megabits per second	**19%**	17%	22%	18%	18%	20%	15%	13%
More than 100 megabits per second	**16%**	2%	14%	12%	22%	15%	10%	5%
Not sure	**44%**	54%	38%	38%	45%	42%	51%	60%

	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Level Of Interest In 25 Megabits Per Second Free Service								
Very interested	**26%**	51%	27%	42%	20%	25%	34%	34%
Somewhat interested	**17%**	16%	16%	7%	16%	22%	19%	22%
Not that interested	**12%**	3%	10%	21%	11%	16%	11%	1%
Not interested at all	**31%**	25%	32%	25%	34%	29%	30%	28%
Not sure	**13%**	6%	15%	5%	19%	8%	7%	16%

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	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Level Of Interest In 25 Megabits Internet Service At Less Than $20 Per Month								
Very interested	**20%**	35%	25%	31%	15%	18%	24%	16%
Somewhat interested	**17%**	25%	15%	15%	13%	21%	22%	25%
Not that interested	**15%**	4%	9%	15%	17%	18%	10%	13%
Not interested at all	**36%**	27%	37%	31%	37%	36%	36%	34%
Not sure	**13%**	8%	14%	8%	19%	7%	7%	13%

	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Level Of Interest In 25 Megabits Internet Service At $21-$40 Per Month								
Very interested	**9%**	24%	15%	21%	5%	6%	13%	7%
Somewhat interested	**15%**	16%	15%	13%	14%	18%	15%	7%
Not that interested	**17%**	23%	10%	18%	16%	22%	17%	18%
Not interested at all	**46%**	31%	47%	43%	47%	47%	46%	46%
Not sure	**13%**	7%	13%	5%	18%	7%	9%	21%

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	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Level Of Interest In 25 Megabits Internet Service At $41-$60 Per Month								
Very interested	**5%**	13%	10%	8%	3%	5%	6%	3%
Somewhat interested	**9%**	13%	8%	5%	7%	13%	9%	12%
Not that interested	**17%**	24%	14%	26%	17%	18%	18%	10%
Not interested at all	**55%**	39%	54%	54%	54%	55%	59%	60%
Not sure	**14%**	12%	14%	7%	19%	8%	9%	16%

	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Level Of Interest In 25 Megabits Internet Service At $61-$80 Per Month								
Very interested	**3%**	4%	5%	2%	2%	3%	2%	-
Somewhat interested	**5%**	6%	4%	3%	4%	8%	2%	8%
Not that interested	**14%**	17%	14%	13%	14%	16%	12%	9%
Not interested at all	**65%**	64%	63%	75%	61%	63%	76%	68%
Not sure	**14%**	10%	14%	8%	19%	9%	9%	15%

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	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Level Of Interest In 25 Megabits Internet Service At $81-$100 Per Month								
Very interested	**2%**	4%	4%	1%	1%	3%	2%	-
Somewhat interested	**3%**	1%	2%	1%	3%	7%	-	2%
Not that interested	**11%**	18%	9%	11%	11%	12%	11%	9%
Not interested at all	**71%**	71%	72%	81%	68%	69%	79%	77%
Not sure	**13%**	6%	13%	7%	17%	9%	8%	12%

	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Level Of Interest In 25 Megabits Internet Service At $101-$120 Per Month								
Very interested	**2%**	-	4%	2%	1%	3%	2%	-
Somewhat interested	**2%**	4%	1%	1%	3%	2%	-	2%
Not that interested	**9%**	17%	10%	7%	8%	10%	6%	7%
Not interested at all	**75%**	73%	74%	80%	71%	77%	83%	80%
Not sure	**13%**	7%	11%	10%	18%	8%	9%	12%

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	Base	Media Market						
		Erie	Harrisbu...	Johnsto...	Philadelp...	Pittsbur...	Scrant...	Oth...
Level Of Interest In 25 Megabits Internet Service At More Than $120 Per Month								
Very interested	**2%**	-	3%	3%	2%	3%	2%	-
Somewhat interested	**2%**	4%	1%	1%	2%	3%	-	-
Not that interested	**7%**	15%	9%	8%	6%	9%	6%	4%
Not interested at all	**76%**	75%	76%	81%	72%	77%	84%	84%
Not sure	**13%**	6%	12%	8%	18%	8%	9%	12%

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Appendix 2: Rural and Urban ZCTAs

ZIP	Total Population, 2010	Square Land Miles, 2010	Population Density, 2010	Rural/Urban Status
Pennsylvania	12,702,375	44,719.7	284.0	
15001	31,964	60.0	532.3	Urban
15003	11,861	6.5	1,816.4	Urban
15004	351	0.3	1,120.5	Urban
15005	9,450	15.7	601.2	Urban
15006	240	0.2	975.2	Urban
15007	323	0.3	971.6	Urban
15009	15,082	24.5	614.6	Urban
15010	28,425	50.0	568.2	Urban
15012	15,905	33.6	474.0	Urban
15014	3,184	0.5	6,263.7	Urban
15015	1,175	0.9	1,255.7	Urban
15017	16,213	13.0	1,244.0	Urban
15018	821	1.9	435.9	Urban
15019	1,719	22.7	75.7	Rural
15020	231	1.3	175.0	Rural
15021	7,352	91.5	80.3	Rural
15022	10,340	18.1	572.6	Urban
15024	9,029	16.7	539.8	Urban
15025	15,944	16.6	962.9	Urban
15026	3,390	33.5	101.2	Rural
15027	2,201	1.4	1,528.8	Urban
15028	142	0.2	710.7	Urban
15030	1,128	1.9	600.1	Urban
15031	513	0.5	1,100.7	Urban
15033	4,910	2.2	2,202.8	Urban
15034	1,792	1.0	1,850.9	Urban

15035	2,129	0.4	5,131.0	Urban
15037	10,894	26.5	411.8	Urban
15038	325	0.4	743.4	Urban
15042	8,105	16.7	486.2	Urban
15043	2,458	32.7	75.1	Rural
15044	27,049	41.3	654.2	Urban
15045	4,483	1.6	2,834.5	Urban
15046	2,640	2.1	1,258.7	Urban
15047	151	0.2	789.1	Urban
15049	895	0.4	2,076.1	Urban
15050	2,431	23.4	103.8	Rural
15051	461	0.8	556.8	Urban
15052	3,483	17.4	199.7	Rural
15053	154	0.1	1,752.8	Urban
15054	375	0.1	2,871.3	Urban
15055	1,360	0.7	2,034.5	Urban
15056	1,140	0.9	1,239.2	Urban
15057	13,930	54.7	254.8	Rural
15059	4,193	14.1	297.7	Urban
15060	790	0.3	2,407.7	Urban
15061	12,799	18.0	711.9	Urban
15062	7,731	3.4	2,300.2	Urban
15063	11,677	28.4	410.5	Urban
15064	382	0.8	463.9	Urban
15065	11,588	12.4	935.9	Urban
15066	12,785	21.6	590.6	Urban
15067	2,281	2.0	1,119.2	Urban
15068	38,785	45.1	860.1	Urban
15071	9,956	18.3	543.4	Urban

15072	101	0.1	1,486.1	Urban
15074	8,874	15.0	592.6	Urban
15075	128	0.0	5,396.8	Urban
15076	849	0.7	1,162.3	Urban
15077	198	1.1	175.7	Rural
15078	523	0.7	714.6	Urban
15081	475	0.3	1,480.8	Urban
15082	350	0.3	1,119.9	Urban
15083	952	3.7	259.8	Rural
15084	10,130	27.8	364.1	Urban
15085	7,944	9.6	830.9	Urban
15086	300	1.6	182.8	Rural
15087	234	0.7	327.2	Urban
15088	535	0.2	2,659.0	Urban
15089	6,262	19.1	327.2	Urban
15090	21,202	21.1	1,003.9	Urban
15101	24,292	20.2	1,201.9	Urban
15102	29,529	10.4	2,852.8	Urban
15104	9,038	2.4	3,691.3	Urban
15106	18,536	11.2	1,659.3	Urban
15108	40,153	39.5	1,017.4	Urban
15110	5,565	1.8	3,061.0	Urban
15112	3,292	0.8	3,937.5	Urban
15116	14,427	8.1	1,785.9	Urban
15120	18,931	4.7	4,051.3	Urban
15122	20,131	12.6	1,596.6	Urban
15126	7,014	22.1	316.8	Urban
15129	10,920	8.1	1,355.9	Urban
15131	8,240	7.3	1,130.7	Urban

15132	21,472	5.6	3,803.3	Urban
15133	6,432	3.0	2,160.0	Urban
15135	5,139	4.2	1,224.2	Urban
15136	21,849	11.1	1,962.5	Urban
15137	10,228	7.7	1,322.2	Urban
15139	6,307	1.9	3,266.4	Urban
15140	3,294	0.5	6,521.5	Urban
15142	1,163	1.5	793.5	Urban
15143	19,660	36.8	533.9	Urban
15144	4,142	2.8	1,501.5	Urban
15145	7,132	2.0	3,619.1	Urban
15146	28,323	19.7	1,437.5	Urban
15147	17,395	10.1	1,719.3	Urban
15148	2,814	1.1	2,522.1	Urban
15201	12,713	2.5	5,127.1	Urban
15202	19,685	4.4	4,477.2	Urban
15203	9,949	1.5	6,738.8	Urban
15204	8,329	1.9	4,466.0	Urban
15205	21,865	10.3	2,122.5	Urban
15206	28,615	4.8	5,991.5	Urban
15207	11,268	4.8	2,350.1	Urban
15208	10,406	1.6	6,466.9	Urban
15209	12,438	4.5	2,759.3	Urban
15210	25,954	4.6	5,594.0	Urban
15211	11,081	1.6	7,083.1	Urban
15212	27,895	6.2	4,482.9	Urban
15213	30,844	2.1	14,473.6	Urban
15214	14,352	4.7	3,056.2	Urban
15215	12,615	6.2	2,050.5	Urban

15216	23,350	3.4	6,820.7	Urban
15217	27,220	3.8	7,151.3	Urban
15218	13,851	2.4	5,840.8	Urban
15219	16,696	2.3	7,277.0	Urban
15220	17,718	4.9	3,589.0	Urban
15221	31,060	6.1	5,052.5	Urban
15222	3,294	0.8	4,055.0	Urban
15223	7,236	1.9	3,774.1	Urban
15224	10,141	1.0	10,074.7	Urban
15225	1,084	1.5	708.0	Urban
15226	13,974	2.5	5,511.3	Urban
15227	28,156	6.2	4,555.8	Urban
15228	17,595	3.1	5,602.7	Urban
15229	13,825	4.0	3,416.6	Urban
15232	11,374	0.8	14,309.6	Urban
15233	4,451	1.2	3,580.6	Urban
15234	14,056	3.2	4,440.2	Urban
15235	34,580	14.7	2,358.3	Urban
15236	29,724	11.1	2,678.1	Urban
15237	41,895	24.2	1,730.3	Urban
15238	13,162	16.4	803.5	Urban
15239	21,024	16.0	1,315.3	Urban
15241	20,395	10.4	1,960.8	Urban
15243	13,406	3.0	4,457.2	Urban
15260	0	0.1	0.0	No Population
15290	0	0.0	0.0	No Population
15301	49,331	121.9	404.6	Urban
15310	290	18.5	15.6	Rural
15311	1,391	23.5	59.1	Rural

15312	3,579	75.0	47.7	Rural
15313	377	0.7	537.4	Urban
15314	3,788	17.3	218.9	Rural
15315	776	1.3	586.7	Urban
15316	131	0.4	331.9	Urban
15317	36,535	45.7	799.0	Urban
15320	5,384	38.8	138.7	Rural
15321	1,676	1.1	1,537.6	Urban
15322	2,018	14.2	142.1	Rural
15323	4,542	69.1	65.7	Rural
15324	632	0.4	1,644.6	Urban
15325	439	0.2	1,815.8	Urban
15327	1,527	19.9	76.8	Rural
15329	1,709	40.5	42.1	Rural
15330	5,299	45.0	117.7	Rural
15331	1,090	0.8	1,431.3	Urban
15332	8,148	27.3	298.8	Urban
15333	2,150	13.8	155.9	Rural
15334	113	1.9	59.6	Rural
15337	744	31.9	23.3	Rural
15338	1,606	18.6	86.2	Rural
15340	1,469	15.5	95.1	Rural
15341	869	49.2	17.7	Rural
15342	4,818	3.3	1,441.8	Urban
15344	1,450	14.3	101.2	Rural
15345	1,642	19.4	84.6	Rural
15346	749	0.9	824.9	Urban
15347	582	0.6	964.0	Urban
15348	283	0.2	1,744.8	Urban

15349	1,737	38.6	45.0	Rural
15350	425	0.1	8,022.0	Urban
15351	901	1.1	825.7	Urban
15352	987	49.7	19.8	Rural
15353	64	0.1	1,081.1	Urban
15357	1,661	8.0	206.5	Rural
15358	923	0.8	1,091.7	Urban
15359	174	0.1	1,225.5	Urban
15360	1,731	25.6	67.6	Rural
15361	151	0.1	1,591.0	Urban
15362	767	25.9	29.6	Rural
15363	760	0.2	3,292.0	Urban
15364	869	37.2	23.4	Rural
15366	164	0.4	460.7	Urban
15367	8,731	9.2	947.6	Urban
15368	473	0.2	2,482.8	Urban
15370	14,870	148.0	100.5	Rural
15376	1,740	38.4	45.3	Rural
15377	724	41.2	17.6	Rural
15378	106	0.1	1,891.2	Urban
15379	132	0.4	329.9	Urban
15380	719	38.7	18.6	Rural
15401	32,288	58.3	553.8	Urban
15410	905	10.6	85.5	Rural
15411	661	17.5	37.8	Rural
15412	470	2.1	226.3	Rural
15413	551	0.7	746.0	Urban
15417	9,469	21.8	433.4	Urban
15419	4,492	1.7	2,591.0	Urban

15420	251	0.5	547.0	Urban
15421	112	0.2	516.2	Urban
15422	220	0.1	2,432.5	Urban
15423	1,781	16.4	108.5	Rural
15424	2,489	72.5	34.3	Rural
15425	19,270	55.7	345.8	Urban
15427	1,091	10.5	104.4	Rural
15428	1,806	20.5	88.1	Rural
15429	126	0.3	406.4	Urban
15430	314	0.4	884.7	Urban
15431	4,744	48.9	97.1	Rural
15432	427	0.6	666.7	Urban
15433	741	14.4	51.6	Rural
15434	313	0.2	1,335.1	Urban
15435	437	1.1	398.1	Urban
15436	2,740	7.0	391.9	Urban
15437	2,573	69.8	36.9	Rural
15438	2,221	11.5	192.8	Rural
15440	349	15.2	23.0	Rural
15442	2,105	15.0	140.3	Rural
15443	377	1.7	222.1	Rural
15444	517	0.6	817.5	Urban
15445	2,693	21.0	128.2	Rural
15446	324	1.5	216.1	Rural
15447	181	0.4	462.7	Urban
15448	192	1.0	200.5	Rural
15449	184	0.2	1,179.0	Urban
15450	2,323	1.6	1,458.1	Urban
15451	955	10.2	94.0	Rural

15454	237	1.3	183.6	Rural
15455	298	0.4	740.6	Urban
15456	2,976	7.6	390.0	Urban
15458	2,379	15.7	152.0	Rural
15459	1,763	33.4	52.8	Rural
15460	120	0.4	286.7	Urban
15461	4,333	10.6	410.3	Urban
15462	398	1.4	281.4	Rural
15463	64	0.3	203.0	Rural
15464	1,536	46.0	33.4	Rural
15466	458	0.4	1,073.1	Urban
15467	141	1.0	141.0	Rural
15468	2,303	10.0	229.3	Rural
15469	2,331	34.0	68.7	Rural
15470	982	31.5	31.1	Rural
15472	306	0.2	1,257.0	Urban
15473	3,862	23.3	165.7	Rural
15474	2,049	7.0	292.0	Urban
15475	1,356	3.2	419.5	Urban
15476	157	0.0	4,143.2	Urban
15477	855	0.2	4,513.7	Urban
15478	6,446	62.8	102.7	Rural
15479	2,113	21.2	99.6	Rural
15480	1,946	18.1	107.6	Rural
15482	604	1.2	523.1	Urban
15483	513	0.3	1,867.6	Urban
15484	328	0.6	515.5	Urban
15486	2,303	19.5	118.0	Rural
15489	389	0.9	416.8	Urban

15490	628	9.6	65.4	Rural
15492	108	0.6	179.2	Rural
15501	16,861	134.0	125.9	Rural
15502	191	6.0	31.9	Rural
15510	2,229	0.3	6,585.5	Urban
15520	293	0.7	432.6	Urban
15521	1,872	35.6	52.6	Rural
15522	12,036	187.3	64.3	Rural
15530	5,368	87.5	61.3	Rural
15531	3,861	59.0	65.5	Rural
15532	142	0.7	210.3	Rural
15533	1,370	37.2	36.8	Rural
15534	932	48.5	19.2	Rural
15535	2,203	157.8	14.0	Rural
15536	459	34.0	13.5	Rural
15537	7,952	112.0	71.0	Rural
15538	824	74.4	11.1	Rural
15539	498	1.4	361.5	Urban
15540	290	36.0	8.1	Rural
15541	3,721	36.0	103.5	Rural
15542	1,175	32.7	35.9	Rural
15544	264	0.6	453.9	Urban
15545	2,879	49.4	58.2	Rural
15546	386	0.8	500.3	Urban
15547	504	0.9	556.2	Urban
15550	1,699	54.2	31.3	Rural
15551	860	35.9	23.9	Rural
15552	6,115	104.4	58.6	Rural
15554	2,553	35.7	71.6	Rural

15555	112	0.1	1,492.1	Urban
15557	3,684	90.8	40.6	Rural
15558	2,126	36.3	58.5	Rural
15559	1,968	46.6	42.3	Rural
15560	175	0.1	1,317.3	Urban
15561	168	0.6	293.6	Urban
15562	201	1.6	123.8	Rural
15563	3,345	56.8	58.9	Rural
15564	50	1.2	41.4	Rural
15601	59,483	86.2	690.1	Urban
15610	3,738	38.6	96.9	Rural
15611	543	0.7	788.1	Urban
15612	474	2.5	189.0	Rural
15613	13,933	59.7	233.2	Rural
15615	387	1.0	393.4	Urban
15616	23	0.1	430.4	Urban
15617	367	0.4	833.1	Urban
15618	2,634	27.7	95.1	Rural
15620	911	1.0	952.9	Urban
15621	47	0.0	7,318.1	Urban
15622	1,387	32.4	42.8	Rural
15623	762	1.7	437.9	Urban
15624	410	0.6	659.2	Urban
15625	144	0.6	245.5	Rural
15626	5,105	3.9	1,294.0	Urban
15627	6,544	28.4	230.4	Rural
15628	525	2.6	205.7	Rural
15629	676	0.1	5,265.7	Urban
15631	1,075	0.8	1,376.9	Urban

15632	9,363	27.1	345.5	Urban
15633	293	0.6	464.9	Urban
15634	523	0.2	3,460.7	Urban
15635	220	0.3	728.6	Urban
15636	3,946	3.0	1,331.1	Urban
15637	1,861	4.7	398.6	Urban
15638	288	0.2	1,615.2	Urban
15639	2,301	11.5	199.6	Rural
15640	378	0.7	523.2	Urban
15641	500	0.2	2,079.7	Urban
15642	45,286	44.2	1,024.6	Urban
15644	18,836	22.1	852.8	Urban
15646	233	1.4	163.2	Rural
15647	314	0.3	1,103.3	Urban
15650	28,432	74.6	380.9	Urban
15655	423	12.9	32.8	Rural
15656	10,298	37.6	273.6	Rural
15658	8,916	98.2	90.8	Rural
15660	323	0.5	618.8	Urban
15661	504	0.4	1,361.6	Urban
15662	271	0.2	1,651.6	Urban
15663	455	1.0	463.4	Urban
15665	1,472	0.9	1,704.3	Urban
15666	16,461	55.0	299.3	Urban
15668	13,139	23.6	557.5	Urban
15670	3,649	38.2	95.4	Rural
15671	865	3.2	270.9	Rural
15672	3,334	11.6	287.2	Urban
15673	1,296	0.5	2,400.8	Urban

15675	1,003	0.9	1,083.4	Urban
15676	437	0.9	470.3	Urban
15677	389	19.6	19.8	Rural
15678	476	0.6	830.1	Urban
15679	3,343	23.5	142.2	Rural
15680	101	0.0	8,510.0	Urban
15681	5,241	52.3	100.2	Rural
15683	8,248	15.6	528.6	Urban
15684	841	5.0	167.4	Rural
15686	972	10.2	95.7	Rural
15687	1,476	28.9	51.1	Rural
15688	641	1.6	412.0	Urban
15689	229	0.1	2,266.6	Urban
15690	9,078	24.4	372.0	Urban
15691	70	0.0	2,104.9	Urban
15692	941	0.5	2,067.4	Urban
15693	189	0.1	2,733.7	Urban
15695	337	0.5	625.3	Urban
15696	384	0.1	2,930.2	Urban
15697	3,038	1.8	1,691.1	Urban
15698	791	1.5	523.4	Urban
15701	34,704	115.3	301.0	Urban
15710	266	1.7	159.7	Rural
15711	412	1.2	329.9	Urban
15712	151	1.6	93.1	Rural
15713	294	1.3	223.6	Rural
15714	5,323	27.4	194.0	Rural
15715	621	0.7	918.6	Urban
15716	683	0.8	844.2	Urban

15717	10,847	95.0	114.2	Rural
15721	234	1.9	121.5	Rural
15722	2,432	20.4	119.1	Rural
15723	46	1.0	43.8	Rural
15724	2,412	47.2	51.1	Rural
15725	1,446	29.9	48.3	Rural
15727	168	1.4	122.6	Rural
15728	3,701	42.8	86.5	Rural
15729	1,537	19.0	80.8	Rural
15730	69	0.8	83.0	Rural
15731	315	0.2	1,322.4	Urban
15732	1,669	29.5	56.6	Rural
15733	108	0.4	271.6	Rural
15734	322	1.4	224.8	Rural
15736	613	3.3	186.1	Rural
15737	83	0.2	469.8	Urban
15738	265	2.6	101.1	Rural
15739	462	0.6	726.9	Urban
15741	83	1.8	47.3	Rural
15742	950	23.5	40.5	Rural
15744	105	4.4	23.6	Rural
15745	337	1.4	237.0	Rural
15746	135	1.5	88.2	Rural
15747	2,027	30.6	66.3	Rural
15748	7,060	74.2	95.1	Rural
15750	245	0.5	504.5	Urban
15752	54	0.0	1,193.9	Urban
15753	513	39.1	13.1	Rural
15754	502	0.4	1,160.0	Urban

15756	207	0.9	235.1	Rural
15757	1,618	79.3	20.4	Rural
15759	3,004	57.3	52.5	Rural
15760	152	1.6	96.5	Rural
15761	111	1.0	107.2	Rural
15762	823	13.4	61.6	Rural
15764	163	1.7	96.0	Rural
15765	1,707	37.5	45.5	Rural
15767	14,668	165.3	88.7	Rural
15770	184	4.1	45.0	Rural
15771	991	33.4	29.6	Rural
15772	1,715	31.9	53.8	Rural
15773	516	3.8	135.6	Rural
15774	3,029	53.7	56.5	Rural
15775	751	3.5	217.1	Rural
15776	52	2.2	23.9	Rural
15777	170	1.1	151.5	Rural
15778	140	0.9	154.0	Rural
15779	414	7.9	52.3	Rural
15780	148	1.3	115.4	Rural
15781	94	1.0	89.7	Rural
15783	140	2.1	67.4	Rural
15784	67	0.3	200.8	Rural
15801	19,270	64.6	298.1	Urban
15821	164	35.5	4.6	Rural
15823	1,431	36.8	38.8	Rural
15824	5,407	73.0	74.0	Rural
15825	9,562	160.4	59.6	Rural
15827	231	2.9	80.2	Rural

15828	286	23.5	12.2	Rural
15829	1,274	35.4	36.0	Rural
15832	328	108.4	3.0	Rural
15834	4,533	204.1	22.2	Rural
15840	1,993	19.2	103.8	Rural
15841	389	4.2	93.1	Rural
15845	3,197	31.0	103.0	Rural
15846	3,636	92.7	39.2	Rural
15847	255	2.7	93.9	Rural
15848	1,027	20.2	50.9	Rural
15849	1,399	78.3	17.9	Rural
15851	6,671	93.6	71.3	Rural
15853	6,578	150.7	43.7	Rural
15856	889	36.3	24.5	Rural
15857	13,212	100.2	131.9	Rural
15860	1,065	124.2	8.6	Rural
15861	174	67.4	2.6	Rural
15863	225	0.7	334.9	Urban
15864	1,845	36.6	50.5	Rural
15865	1,295	3.4	385.6	Urban
15866	261	1.2	210.5	Rural
15868	1,350	94.7	14.3	Rural
15870	1,326	127.6	10.4	Rural
15901	4,190	1.5	2,828.4	Urban
15902	12,513	9.1	1,373.3	Urban
15904	16,608	30.7	541.4	Urban
15905	21,226	35.8	592.2	Urban
15906	11,144	34.8	319.9	Urban
15909	5,611	17.2	326.6	Urban

15920	922	7.8	118.3	Rural
15921	176	0.3	535.6	Urban
15922	177	0.7	256.9	Rural
15923	1,770	26.0	68.0	Rural
15924	1,034	26.6	38.9	Rural
15925	147	0.1	1,924.1	Urban
15926	2,676	28.1	95.3	Rural
15927	1,176	4.8	247.1	Rural
15928	1,974	6.2	315.9	Urban
15929	75	0.6	129.8	Rural
15930	241	0.3	847.2	Urban
15931	9,148	77.5	118.0	Rural
15934	218	0.3	639.5	Urban
15935	2,620	24.1	108.7	Rural
15936	1,620	24.6	65.9	Rural
15937	779	1.0	807.6	Urban
15938	2,583	19.8	130.4	Rural
15940	3,992	26.6	150.1	Rural
15942	2,079	18.5	112.1	Rural
15943	3,942	19.3	204.6	Rural
15944	3,472	65.9	52.7	Rural
15945	198	0.6	336.3	Urban
15946	7,093	50.5	140.5	Rural
15948	550	0.7	744.9	Urban
15949	672	2.6	260.1	Rural
15951	453	1.1	418.7	Urban
15952	1,413	3.3	426.9	Urban
15953	83	0.8	100.2	Rural
15954	2,413	18.1	133.0	Rural

15955	2,551	25.2	101.2	Rural
15956	2,739	8.1	340.2	Urban
15957	755	9.5	79.6	Rural
15958	2,301	19.1	120.6	Rural
15960	425	4.7	89.9	Rural
15961	854	16.7	51.0	Rural
15962	149	0.2	737.4	Urban
15963	11,114	97.7	113.7	Rural
16001	40,371	73.4	549.9	Urban
16002	15,877	72.2	219.9	Rural
16020	1,150	25.5	45.1	Rural
16022	368	0.8	458.3	Urban
16023	4,169	26.3	158.5	Rural
16024	209	0.2	885.1	Urban
16025	5,564	53.2	104.6	Rural
16027	306	0.5	577.2	Urban
16028	1,886	15.9	118.3	Rural
16029	705	0.9	814.6	Urban
16030	316	1.1	291.6	Urban
16033	6,165	30.9	199.5	Rural
16034	2,054	19.8	103.5	Rural
16035	122	0.6	217.9	Rural
16036	200	2.2	89.5	Rural
16037	4,589	34.8	131.7	Rural
16038	3,517	47.8	73.5	Rural
16040	975	19.6	49.7	Rural
16041	1,888	27.8	67.9	Rural
16045	1,195	0.6	2,068.4	Urban
16046	14,396	22.7	633.3	Urban

16048	139	1.1	125.8	Rural
16049	3,241	92.3	35.1	Rural
16050	1,546	24.6	62.9	Rural
16051	3,043	38.9	78.2	Rural
16052	2,447	20.1	121.6	Rural
16053	4,020	21.5	187.4	Rural
16054	497	1.9	263.1	Rural
16055	8,486	38.9	217.9	Rural
16056	4,791	21.2	226.1	Rural
16057	13,909	87.2	159.4	Rural
16059	7,738	25.7	301.5	Urban
16061	2,761	44.0	62.8	Rural
16063	6,559	17.8	368.8	Urban
16066	28,060	22.4	1,255.5	Urban
16101	34,042	71.2	477.8	Urban
16102	5,755	24.0	239.4	Rural
16105	15,448	27.4	563.2	Urban
16110	314	7.5	41.7	Rural
16111	1,409	28.1	50.2	Rural
16112	1,571	6.7	233.7	Rural
16113	448	0.7	613.7	Urban
16114	606	10.1	59.7	Rural
16115	3,287	40.2	81.7	Rural
16116	3,074	26.4	116.3	Rural
16117	17,185	36.8	467.0	Urban
16120	2,463	33.1	74.4	Rural
16121	4,941	2.3	2,176.6	Urban
16123	2,237	20.2	110.5	Rural
16124	2,228	28.0	79.5	Rural

16125	18,186	109.4	166.2	Rural
16127	16,145	71.8	224.8	Rural
16130	2,023	30.9	65.4	Rural
16131	933	20.9	44.6	Rural
16132	355	1.8	200.9	Rural
16133	1,573	27.7	56.7	Rural
16134	3,886	46.8	83.0	Rural
16136	801	0.7	1,086.4	Urban
16137	12,941	108.0	119.8	Rural
16140	123	0.2	713.7	Urban
16141	1,806	20.5	88.0	Rural
16142	7,056	42.0	168.2	Rural
16143	2,901	26.1	111.0	Rural
16145	2,726	48.4	56.3	Rural
16146	14,040	3.8	3,674.4	Urban
16148	16,959	32.1	528.9	Urban
16150	7,426	23.0	323.2	Urban
16151	77	0.1	660.0	Urban
16153	2,624	43.2	60.7	Rural
16154	2,492	26.0	95.7	Rural
16155	103	0.7	152.1	Rural
16156	3,319	49.8	66.6	Rural
16157	3,477	25.0	138.9	Rural
16159	4,706	27.3	172.7	Rural
16160	864	1.2	691.9	Urban
16161	644	0.9	736.5	Urban
16201	18,214	114.7	158.9	Rural
16210	1,014	19.7	51.3	Rural
16211	104	1.0	102.7	Rural

16212	339	1.0	350.6	Urban
16213	204	0.1	1,416.7	Urban
16214	10,127	49.2	205.8	Rural
16217	101	5.6	17.9	Rural
16218	1,195	28.4	42.1	Rural
16222	2,526	65.8	38.4	Rural
16223	154	1.1	142.3	Rural
16224	1,181	20.1	58.9	Rural
16226	8,279	57.9	143.0	Rural
16228	371	0.1	4,881.6	Urban
16229	4,997	24.9	200.7	Rural
16230	494	1.0	482.1	Urban
16232	4,281	57.0	75.0	Rural
16233	1,246	40.5	30.8	Rural
16235	1,256	28.2	44.6	Rural
16236	262	0.1	3,987.0	Urban
16238	410	0.1	4,422.8	Urban
16239	4,172	197.1	21.2	Rural
16240	1,533	53.7	28.6	Rural
16242	4,693	90.5	51.9	Rural
16244	265	1.2	219.8	Rural
16245	207	0.6	348.9	Urban
16246	252	0.3	744.5	Urban
16248	3,130	52.1	60.1	Rural
16249	2,089	27.8	75.2	Rural
16250	315	2.8	114.3	Rural
16253	91	0.2	430.8	Urban
16254	3,471	51.0	68.1	Rural
16255	1,943	40.9	47.5	Rural

16256	2,084	39.8	52.3	Rural
16258	1,869	34.1	54.8	Rural
16259	1,934	46.4	41.7	Rural
16260	296	9.3	31.8	Rural
16262	3,007	35.0	86.0	Rural
16263	317	1.6	201.9	Rural
16301	16,321	106.6	153.1	Rural
16311	564	14.7	38.4	Rural
16312	25	0.0	895.6	Urban
16313	1,848	98.4	18.8	Rural
16314	5,507	91.1	60.4	Rural
16316	5,436	47.5	114.5	Rural
16317	1,456	29.9	48.7	Rural
16319	1,355	34.3	39.5	Rural
16321	76	1.3	59.7	Rural
16322	158	6.1	25.9	Rural
16323	16,372	100.7	162.6	Rural
16326	391	6.8	57.2	Rural
16327	2,978	66.2	45.0	Rural
16328	80	0.1	1,414.3	Urban
16329	528	8.2	64.3	Rural
16331	88	1.3	66.8	Rural
16332	53	3.0	17.7	Rural
16333	240	6.6	36.6	Rural
16334	338	5.4	62.1	Rural
16335	28,445	112.2	253.5	Rural
16340	1,990	96.3	20.7	Rural
16341	2,030	67.6	30.0	Rural
16342	2,281	61.7	36.9	Rural

16343	449	4.8	94.4	Rural
16344	523	0.9	585.4	Urban
16345	3,543	89.2	39.7	Rural
16346	3,247	16.4	197.6	Rural
16347	2,238	102.9	21.8	Rural
16350	2,737	46.0	59.5	Rural
16351	1,716	99.4	17.3	Rural
16352	245	12.8	19.1	Rural
16353	3,348	145.2	23.1	Rural
16354	11,379	123.9	91.9	Rural
16360	1,383	28.7	48.1	Rural
16361	53	2.2	24.3	Rural
16362	1,102	26.3	41.9	Rural
16364	1,347	33.4	40.3	Rural
16365	18,579	145.8	127.5	Rural
16370	358	12.6	28.5	Rural
16371	3,260	30.6	106.4	Rural
16372	499	1.2	420.5	Urban
16373	3,510	80.0	43.9	Rural
16374	1,968	71.3	27.6	Rural
16401	6,581	57.0	115.4	Rural
16402	956	22.1	43.2	Rural
16403	7,029	92.6	75.9	Rural
16404	3,269	90.2	36.3	Rural
16405	922	24.2	38.0	Rural
16406	3,509	76.5	45.9	Rural
16407	11,317	107.5	105.3	Rural
16410	1,854	22.5	82.3	Rural
16411	1,477	17.8	83.1	Rural

16412	10,480	80.1	130.8	Rural
16415	8,916	23.7	376.1	Urban
16416	203	3.9	51.9	Rural
16417	8,329	46.4	179.5	Rural
16420	650	48.6	13.4	Rural
16421	2,518	10.6	237.6	Rural
16422	401	1.4	291.3	Urban
16423	4,450	9.5	470.3	Urban
16424	4,676	68.3	68.5	Rural
16426	3,730	27.1	137.7	Rural
16427	193	0.3	744.4	Urban
16428	12,478	73.4	170.0	Rural
16433	5,384	56.2	95.8	Rural
16434	2,990	62.6	47.7	Rural
16435	2,108	55.8	37.8	Rural
16436	756	46.5	16.3	Rural
16438	8,083	103.3	78.3	Rural
16440	891	10.9	81.4	Rural
16441	10,136	112.7	90.0	Rural
16442	2,958	50.3	58.8	Rural
16443	1,425	11.3	126.4	Rural
16444	1,717	0.3	6,545.1	Urban
16501	2,044	0.7	3,003.9	Urban
16502	16,664	2.6	6,533.3	Urban
16503	16,850	2.4	6,887.1	Urban
16504	17,322	2.8	6,213.5	Urban
16505	17,168	11.9	1,446.7	Urban
16506	23,720	14.0	1,694.3	Urban
16507	11,088	2.1	5,277.6	Urban

16508	16,050	2.8	5,681.7	Urban
16509	26,810	38.1	703.2	Urban
16510	25,625	32.8	781.9	Urban
16511	11,382	7.5	1,518.7	Urban
16546	1,154	0.1	21,023.6	Urban
16563	1,621	0.4	3,651.1	Urban
16601	33,870	86.5	391.5	Urban
16602	29,554	14.8	1,996.7	Urban
16611	2,410	42.7	56.4	Rural
16613	1,535	25.6	59.9	Rural
16616	116	2.3	50.8	Rural
16617	2,806	1.6	1,728.2	Urban
16619	347	13.3	26.0	Rural
16620	414	0.9	484.0	Urban
16621	737	13.0	56.5	Rural
16622	175	7.4	23.5	Rural
16623	567	12.9	43.9	Rural
16624	204	1.2	173.8	Rural
16625	3,868	32.1	120.7	Rural
16627	2,278	32.5	70.0	Rural
16630	5,080	11.0	463.7	Urban
16631	90	0.6	149.6	Rural
16633	200	0.3	591.8	Urban
16634	302	3.4	88.1	Rural
16635	11,321	56.8	199.5	Rural
16636	742	28.1	26.4	Rural
16637	2,873	18.7	153.2	Rural
16638	67	0.7	97.4	Rural
16639	1,494	36.1	41.4	Rural

16640	817	13.2	61.8	Rural
16641	2,598	16.9	154.1	Rural
16645	142	1.8	80.5	Rural
16646	2,558	19.1	133.7	Rural
16647	764	22.0	34.7	Rural
16648	15,538	57.6	269.7	Rural
16650	2,036	44.9	45.3	Rural
16651	5,813	42.4	137.0	Rural
16652	18,028	176.8	102.0	Rural
16655	1,601	34.9	45.9	Rural
16656	1,297	28.7	45.2	Rural
16657	1,343	52.0	25.8	Rural
16659	303	1.8	166.6	Rural
16661	951	20.2	47.0	Rural
16662	6,040	59.1	102.2	Rural
16664	2,104	40.9	51.5	Rural
16665	299	0.4	740.3	Urban
16666	2,960	26.0	113.7	Rural
16667	1,392	17.0	82.1	Rural
16668	3,569	54.2	65.9	Rural
16669	2,351	106.0	22.2	Rural
16670	47	0.2	295.1	Urban
16671	505	2.4	206.9	Rural
16672	187	4.3	43.2	Rural
16673	5,519	31.1	177.7	Rural
16674	736	22.6	32.6	Rural
16677	481	2.3	208.6	Rural
16678	2,689	45.4	59.2	Rural
16679	844	21.0	40.1	Rural

16680	427	6.8	63.2	Rural
16682	117	0.2	545.4	Urban
16683	383	15.2	25.2	Rural
16685	249	9.1	27.3	Rural
16686	13,488	135.1	99.8	Rural
16689	462	20.5	22.5	Rural
16691	314	28.9	10.9	Rural
16692	753	16.8	44.7	Rural
16693	4,185	74.9	55.9	Rural
16694	254	2.2	114.7	Rural
16695	1,198	15.8	76.0	Rural
16699	1,469	0.1	23,067.7	Urban
16701	17,980	215.8	83.3	Rural
16720	1,392	292.7	4.8	Rural
16724	143	2.3	63.5	Rural
16725	166	0.4	379.4	Urban
16726	542	25.5	21.3	Rural
16727	211	4.3	49.0	Rural
16728	25	5.6	4.5	Rural
16729	761	13.8	55.0	Rural
16730	121	0.6	206.8	Rural
16731	2,818	59.3	47.5	Rural
16732	293	6.6	44.4	Rural
16733	222	11.5	19.4	Rural
16734	287	0.8	353.5	Urban
16735	6,309	273.8	23.0	Rural
16738	2,679	65.5	40.9	Rural
16740	1,032	42.3	24.4	Rural
16743	3,942	107.3	36.7	Rural

16744	332	6.9	48.3	Rural
16745	611	11.2	54.5	Rural
16746	1,265	41.6	30.4	Rural
16748	2,997	103.2	29.0	Rural
16749	4,319	163.9	26.3	Rural
16750	417	19.3	21.6	Rural
16801	42,812	31.3	1,367.8	Urban
16802	12,764	0.8	15,305.6	Urban
16803	23,685	24.2	977.2	Urban
16820	1,217	28.4	42.8	Rural
16821	318	1.1	296.5	Urban
16822	2,283	98.3	23.2	Rural
16823	26,617	128.3	207.5	Rural
16825	240	0.5	446.9	Urban
16826	616	3.3	187.9	Rural
16827	3,991	17.5	227.7	Rural
16828	4,478	56.3	79.6	Rural
16829	666	32.2	20.7	Rural
16830	13,695	128.0	107.0	Rural
16832	510	17.3	29.5	Rural
16833	5,342	71.4	74.8	Rural
16834	299	18.2	16.4	Rural
16835	238	0.2	1,426.6	Urban
16836	1,152	122.0	9.4	Rural
16837	186	0.8	219.8	Rural
16838	1,821	40.9	44.5	Rural
16839	489	1.1	457.3	Urban
16840	510	0.8	672.5	Urban
16841	5,934	131.6	45.1	Rural

16843	657	0.4	1,645.6	Urban
16844	2,769	62.7	44.2	Rural
16845	1,088	121.4	9.0	Rural
16847	335	1.3	259.8	Rural
16848	319	0.4	834.8	Urban
16849	331	4.1	80.4	Rural
16851	866	4.1	210.3	Rural
16852	371	3.4	110.3	Rural
16853	300	0.3	1,126.4	Urban
16854	947	2.4	396.5	Urban
16855	282	2.7	105.4	Rural
16858	3,688	53.7	68.7	Rural
16859	542	22.8	23.8	Rural
16860	451	5.4	82.9	Rural
16861	311	12.1	25.7	Rural
16863	718	25.4	28.2	Rural
16865	1,839	35.1	52.4	Rural
16866	9,881	160.2	61.7	Rural
16868	483	0.6	804.6	Urban
16870	7,046	68.1	103.5	Rural
16871	46	24.9	1.8	Rural
16872	1,551	57.9	26.8	Rural
16874	1,371	34.5	39.7	Rural
16875	3,945	77.9	50.7	Rural
16876	311	1.1	285.1	Urban
16877	1,762	31.6	55.7	Rural
16878	1,762	20.4	86.4	Rural
16879	532	2.2	244.9	Rural
16881	2,232	31.4	71.1	Rural

16882	300	26.4	11.4	Rural
16901	10,243	232.6	44.0	Rural
16911	332	8.7	38.3	Rural
16912	1,776	25.3	70.2	Rural
16914	2,347	75.6	31.0	Rural
16915	5,929	243.6	24.3	Rural
16917	1,437	44.5	32.3	Rural
16920	2,006	9.6	210.0	Rural
16921	475	61.5	7.7	Rural
16922	2,002	153.2	13.1	Rural
16923	1,470	78.3	18.8	Rural
16925	3,186	77.2	41.3	Rural
16926	872	24.2	36.0	Rural
16927	651	18.9	34.5	Rural
16928	1,387	34.5	40.2	Rural
16929	2,320	46.2	50.2	Rural
16930	1,300	66.7	19.5	Rural
16932	734	21.3	34.5	Rural
16933	7,488	97.5	76.8	Rural
16935	1,256	50.0	25.1	Rural
16936	2,095	48.2	43.4	Rural
16937	172	7.3	23.4	Rural
16938	747	105.7	7.1	Rural
16939	295	2.7	109.6	Rural
16940	302	2.3	129.2	Rural
16941	69	2.4	28.3	Rural
16942	847	23.7	35.8	Rural
16943	549	37.7	14.6	Rural
16946	2,484	61.6	40.3	Rural

16947	4,818	115.3	41.8	Rural
16948	1,634	92.4	17.7	Rural
16950	3,378	114.6	29.5	Rural
17002	784	13.7	57.4	Rural
17003	11,720	47.5	247.0	Rural
17004	5,000	48.8	102.4	Rural
17005	368	0.6	646.7	Urban
17006	1,052	76.9	13.7	Rural
17007	5,591	20.8	269.1	Rural
17009	2,007	1.5	1,350.4	Urban
17010	182	0.0	5,281.4	Urban
17011	34,586	13.0	2,657.3	Urban
17013	34,575	42.9	805.9	Urban
17015	20,798	113.7	182.9	Rural
17016	799	0.7	1,102.6	Urban
17017	1,755	21.9	80.2	Rural
17018	4,313	39.8	108.3	Rural
17019	17,721	63.0	281.5	Rural
17020	9,047	57.5	157.3	Rural
17021	1,088	52.2	20.9	Rural
17022	29,602	55.0	538.1	Urban
17023	3,535	22.5	157.0	Rural
17024	1,893	31.6	60.0	Rural
17025	16,778	15.1	1,111.6	Urban
17026	3,616	22.5	161.0	Rural
17027	2,141	0.4	5,714.7	Urban
17028	3,720	24.4	152.7	Rural
17029	371	1.4	271.7	Rural
17030	832	4.1	204.6	Rural

17032	8,192	110.5	74.2	Rural
17033	16,972	25.7	660.4	Urban
17034	2,414	0.7	3,245.9	Urban
17035	839	35.3	23.7	Rural
17036	21,913	27.4	801.0	Urban
17037	1,126	24.7	45.6	Rural
17038	8,219	72.1	114.1	Rural
17039	37	0.6	61.6	Rural
17040	2,787	50.0	55.7	Rural
17041	213	0.6	378.5	Urban
17042	37,133	66.1	561.4	Urban
17043	5,957	2.0	2,947.6	Urban
17044	21,209	98.1	216.2	Rural
17045	3,350	39.2	85.4	Rural
17046	29,790	38.2	779.1	Urban
17047	2,526	46.1	54.8	Rural
17048	4,046	34.7	116.6	Rural
17049	3,360	40.0	83.9	Rural
17050	32,815	32.1	1,022.5	Urban
17051	4,653	88.1	52.8	Rural
17052	1,635	40.1	40.7	Rural
17053	5,001	28.8	173.9	Rural
17055	34,237	41.7	821.7	Urban
17056	128	0.1	1,515.6	Urban
17057	21,329	32.3	660.2	Urban
17058	1,909	39.5	48.4	Rural
17059	7,579	82.1	92.3	Rural
17060	1,334	25.2	53.0	Rural
17061	7,157	34.2	209.5	Rural

17062	3,979	81.3	48.9	Rural
17063	3,311	93.7	35.3	Rural
17064	645	1.2	544.4	Urban
17065	4,222	8.6	489.2	Urban
17066	5,348	32.0	167.1	Rural
17067	14,232	49.1	290.1	Urban
17068	4,298	33.6	128.0	Rural
17069	133	0.0	2,713.7	Urban
17070	15,692	13.4	1,169.9	Urban
17071	108	8.3	13.0	Rural
17072	193	0.1	2,890.7	Urban
17073	5,271	26.0	202.7	Rural
17074	7,477	63.6	117.5	Rural
17075	123	0.1	823.9	Urban
17076	48	0.2	315.3	Urban
17077	46	0.0	12,820.3	Urban
17078	20,218	30.3	667.2	Urban
17080	298	0.5	621.6	Urban
17081	352	0.6	576.1	Urban
17082	3,588	58.2	61.7	Rural
17083	109	0.0	3,049.8	Urban
17084	4,340	32.0	135.7	Rural
17086	2,499	38.2	65.4	Rural
17087	2,767	12.3	225.5	Rural
17088	823	1.8	450.2	Urban
17090	5,216	33.8	154.1	Rural
17093	801	0.4	2,136.3	Urban
17094	2,392	30.0	79.8	Rural
17097	925	3.0	306.8	Urban

17098	2,528	9.7	259.8	Rural
17099	1,179	1.5	768.6	Urban
17101	2,212	0.5	4,665.5	Urban
17102	7,628	0.8	9,722.6	Urban
17103	11,848	2.1	5,759.9	Urban
17104	20,962	2.7	7,808.7	Urban
17109	23,131	7.5	3,077.5	Urban
17110	24,433	12.8	1,914.3	Urban
17111	30,714	18.4	1,666.8	Urban
17112	33,850	69.0	490.5	Urban
17113	10,749	4.3	2,520.3	Urban
17120	0	0.1	0.0	No Population
17201	25,293	18.9	1,335.2	Urban
17202	30,200	119.0	253.7	Rural
17210	193	12.0	16.1	Rural
17211	368	25.0	14.7	Rural
17212	702	35.2	19.9	Rural
17213	639	39.8	16.0	Rural
17214	1,089	4.0	273.7	Rural
17215	347	11.9	29.1	Rural
17217	150	3.9	38.9	Rural
17219	405	13.1	30.9	Rural
17220	534	13.0	40.9	Rural
17221	637	10.3	61.8	Rural
17222	10,749	58.7	183.0	Rural
17223	289	10.9	26.5	Rural
17224	1,834	36.6	50.1	Rural
17225	18,879	81.4	231.9	Rural
17228	1,183	28.7	41.3	Rural

17229	1,276	27.2	47.0	Rural
17233	5,047	79.8	63.3	Rural
17235	672	0.6	1,129.8	Urban
17236	8,895	123.9	71.8	Rural
17237	1,917	2.9	664.7	Urban
17238	1,794	54.6	32.8	Rural
17239	203	9.0	22.7	Rural
17240	3,345	48.0	69.7	Rural
17241	11,853	112.2	105.6	Rural
17243	1,329	59.7	22.3	Rural
17244	2,407	25.9	93.0	Rural
17246	195	1.6	119.9	Rural
17247	366	0.1	2,516.5	Urban
17249	371	0.3	1,187.2	Urban
17250	68	0.0	7,750.4	Urban
17251	158	2.2	70.9	Rural
17252	3,608	27.8	129.7	Rural
17253	337	0.3	1,271.6	Urban
17254	89	0.4	250.6	Rural
17255	1,125	30.0	37.5	Rural
17256	91	0.1	856.8	Urban
17257	27,996	117.4	238.4	Rural
17260	1,164	35.8	32.5	Rural
17261	193	2.4	80.4	Rural
17262	1,462	26.9	54.3	Rural
17263	467	0.4	1,326.2	Urban
17264	2,305	54.4	42.3	Rural
17265	496	37.9	13.1	Rural
17266	581	1.3	431.8	Urban

17267	2,810	95.8	29.3	Rural
17268	28,285	79.1	357.4	Urban
17270	115	0.1	1,174.1	Urban
17271	339	10.7	31.8	Rural
17272	294	0.2	1,604.8	Urban
17301	4,053	13.1	308.7	Urban
17302	3,083	38.4	80.2	Rural
17304	3,059	24.3	126.1	Rural
17306	318	0.3	924.4	Urban
17307	5,899	59.6	99.0	Rural
17309	2,086	24.8	84.2	Rural
17311	252	0.1	4,592.8	Urban
17313	10,899	10.6	1,029.3	Urban
17314	5,929	35.5	167.0	Rural
17315	25,756	62.5	412.1	Urban
17316	8,266	41.7	198.1	Rural
17317	755	0.2	3,328.3	Urban
17318	344	0.6	574.2	Urban
17319	10,417	17.3	601.0	Urban
17320	7,823	55.6	140.8	Rural
17321	2,238	16.3	137.2	Rural
17322	6,012	38.2	157.5	Rural
17324	4,219	52.1	80.9	Rural
17325	27,619	128.5	214.9	Rural
17327	7,565	45.9	164.7	Rural
17329	2,494	16.4	152.5	Rural
17331	50,292	75.8	663.5	Urban
17339	6,940	28.1	247.4	Rural
17340	10,896	38.7	281.6	Rural

17343	180	0.8	235.3	Rural
17344	3,656	0.8	4,575.8	Urban
17345	7,679	10.1	761.3	Urban
17347	6,202	13.7	451.3	Urban
17349	7,570	20.7	365.0	Urban
17350	12,886	43.4	297.0	Urban
17352	1,292	13.8	93.7	Rural
17353	3,228	40.8	79.1	Rural
17355	261	0.6	427.5	Urban
17356	21,610	32.5	664.6	Urban
17360	5,927	26.8	220.8	Rural
17361	5,806	3.1	1,854.6	Urban
17362	13,397	48.2	277.8	Rural
17363	9,413	37.6	250.2	Rural
17364	3,907	16.7	233.9	Rural
17365	2,510	19.8	126.8	Rural
17366	5,499	11.3	488.2	Urban
17368	7,322	18.3	399.4	Urban
17370	5,683	11.3	504.8	Urban
17371	257	0.2	1,281.3	Urban
17372	4,101	32.7	125.4	Rural
17401	17,687	1.4	12,312.0	Urban
17402	36,360	19.2	1,890.7	Urban
17403	39,042	20.4	1,909.4	Urban
17404	35,517	21.2	1,675.9	Urban
17406	22,156	49.6	447.1	Urban
17407	2,355	1.4	1,637.9	Urban
17408	22,507	25.9	870.5	Urban
17501	4,307	1.4	3,095.9	Urban

17502	2,464	9.9	249.0	Rural
17505	1,785	6.9	258.7	Rural
17507	62	0.0	2,882.6	Urban
17508	423	0.1	2,865.8	Urban
17509	4,664	25.8	180.9	Rural
17512	17,836	16.3	1,095.7	Urban
17516	4,496	20.8	216.4	Rural
17517	15,391	34.9	440.5	Urban
17518	1,355	14.1	95.8	Rural
17519	6,824	22.2	307.6	Urban
17520	4,686	1.9	2,512.5	Urban
17522	32,483	43.7	743.4	Urban
17527	6,080	20.4	297.7	Urban
17529	4,317	15.7	275.0	Rural
17532	3,381	21.2	159.5	Rural
17535	2,458	10.8	226.8	Rural
17536	2,839	21.7	131.1	Rural
17538	6,045	3.8	1,574.9	Urban
17540	9,791	19.6	500.3	Urban
17543	42,626	69.3	614.9	Urban
17545	21,256	70.9	299.7	Urban
17547	7,378	12.0	614.9	Urban
17550	790	0.2	4,447.7	Urban
17551	10,857	10.1	1,076.2	Urban
17552	17,831	32.5	549.4	Urban
17554	7,525	3.1	2,402.2	Urban
17555	7,525	34.9	215.5	Rural
17557	13,811	32.5	425.5	Urban
17560	5,118	16.1	318.8	Urban

17562	4,464	17.1	261.4	Rural
17563	3,849	31.6	121.9	Rural
17565	2,537	13.8	184.2	Rural
17566	12,019	58.4	206.0	Rural
17569	5,448	16.4	333.0	Urban
17570	291	0.1	4,213.0	Urban
17572	3,859	17.4	221.8	Rural
17576	129	0.1	2,525.3	Urban
17578	7,485	15.3	489.0	Urban
17579	5,935	13.9	426.3	Urban
17581	951	0.3	2,840.7	Urban
17582	2,026	8.9	228.1	Rural
17584	8,957	14.5	617.4	Urban
17601	49,779	33.3	1,494.4	Urban
17602	52,452	25.6	2,046.5	Urban
17603	61,973	29.8	2,079.3	Urban
17606	392	0.0	8,356.5	Urban
17701	44,661	89.4	499.3	Urban
17702	10,721	61.9	173.2	Rural
17721	1,604	0.7	2,170.8	Urban
17723	34	13.2	2.6	Rural
17724	5,424	112.1	48.4	Rural
17727	72	106.9	0.7	Rural
17728	5,120	47.5	107.8	Rural
17729	159	109.2	1.5	Rural
17730	257	0.2	1,520.6	Urban
17731	185	13.9	13.4	Rural
17737	6,220	72.1	86.3	Rural
17739	32	12.5	2.6	Rural

17740	12,754	136.2	93.6	Rural
17742	39	0.1	513.0	Urban
17744	3,175	23.9	132.7	Rural
17745	19,063	215.9	88.3	Rural
17747	3,073	96.5	31.8	Rural
17748	300	0.5	568.8	Urban
17749	244	0.1	2,275.9	Urban
17750	167	1.5	109.9	Rural
17751	7,084	126.2	56.1	Rural
17752	4,635	35.4	130.9	Rural
17754	12,233	60.1	203.4	Rural
17756	12,408	112.4	110.4	Rural
17758	919	81.9	11.2	Rural
17760	557	82.9	6.7	Rural
17762	503	0.6	866.3	Urban
17763	309	24.8	12.4	Rural
17764	2,327	160.0	14.5	Rural
17765	1,162	82.6	14.1	Rural
17767	91	0.0	3,531.2	Urban
17768	377	29.4	12.8	Rural
17771	3,158	215.8	14.6	Rural
17772	2,399	22.5	106.6	Rural
17774	1,277	47.7	26.8	Rural
17776	295	87.5	3.4	Rural
17777	7,056	37.7	187.2	Rural
17778	102	87.3	1.2	Rural
17779	235	1.5	161.6	Rural
17801	16,671	66.1	252.1	Rural
17810	4,683	56.7	82.5	Rural

17812	1,480	22.4	66.1	Rural
17813	1,979	34.3	57.7	Rural
17814	4,860	138.0	35.2	Rural
17815	30,967	135.9	227.9	Rural
17820	5,556	90.4	61.4	Rural
17821	18,219	133.5	136.4	Rural
17822	0	0.1	0.0	No Population
17823	1,273	34.3	37.1	Rural
17824	4,115	26.4	155.8	Rural
17827	657	1.9	342.4	Urban
17829	244	0.8	299.4	Urban
17830	1,947	30.6	63.7	Rural
17832	628	0.4	1,608.0	Urban
17834	3,565	5.1	694.5	Urban
17835	219	0.5	431.2	Urban
17836	266	4.1	65.0	Rural
17837	19,815	62.3	318.0	Urban
17840	533	2.5	214.0	Rural
17841	4,779	79.2	60.4	Rural
17842	8,910	82.9	107.5	Rural
17844	10,042	112.1	89.6	Rural
17845	2,245	65.5	34.3	Rural
17846	3,738	46.4	80.5	Rural
17847	12,051	46.9	256.8	Rural
17850	645	0.3	1,979.5	Urban
17851	7,841	15.1	517.6	Urban
17853	3,221	42.3	76.2	Rural
17855	992	2.0	508.1	Urban
17856	3,365	35.5	94.8	Rural

17857	7,505	26.8	280.2	Rural
17859	3,106	38.6	80.6	Rural
17860	1,994	26.4	75.5	Rural
17861	143	0.1	991.8	Urban
17862	577	0.4	1,403.1	Urban
17864	2,445	20.0	122.1	Rural
17865	92	0.2	591.6	Urban
17866	10,310	25.1	410.9	Urban
17867	169	3.6	47.6	Rural
17868	1,052	0.7	1,567.0	Urban
17870	14,564	45.1	323.0	Urban
17872	9,943	40.6	245.1	Rural
17876	1,698	1.9	916.4	Urban
17878	1,528	21.1	72.5	Rural
17880	72	0.1	579.7	Urban
17881	1,556	4.8	327.3	Urban
17884	305	0.5	617.7	Urban
17885	141	10.8	13.0	Rural
17886	895	1.0	918.8	Urban
17887	1,778	1.1	1,576.9	Urban
17888	326	2.8	114.5	Rural
17889	2,735	22.7	120.4	Rural
17901	23,990	78.0	307.5	Urban
17920	331	4.4	74.5	Rural
17921	7,676	37.7	203.4	Rural
17922	4,783	30.4	157.4	Rural
17923	433	8.7	49.9	Rural
17925	376	1.0	384.7	Urban
17929	1,606	1.0	1,594.7	Urban

17930	476	3.1	155.8	Rural
17931	8,472	10.5	810.4	Urban
17933	89	0.1	990.9	Urban
17934	469	0.9	495.6	Urban
17935	1,737	4.4	398.3	Urban
17936	763	0.6	1,286.7	Urban
17938	2,442	39.6	61.6	Rural
17941	834	24.7	33.8	Rural
17943	229	0.6	394.8	Urban
17944	205	0.1	1,496.6	Urban
17945	180	1.0	173.6	Rural
17946	263	1.9	137.6	Rural
17948	5,029	25.6	196.4	Rural
17949	263	0.1	2,612.3	Urban
17951	325	0.2	1,759.1	Urban
17952	282	3.5	81.1	Rural
17953	469	13.7	34.3	Rural
17954	4,564	0.7	6,556.7	Urban
17957	328	0.2	2,086.8	Urban
17959	1,422	9.0	157.6	Rural
17960	3,868	51.6	74.9	Rural
17961	6,958	26.6	261.4	Rural
17963	9,317	90.8	102.7	Rural
17964	798	22.9	34.8	Rural
17965	2,067	0.7	2,895.0	Urban
17967	2,457	29.1	84.4	Rural
17968	329	3.9	84.2	Rural
17970	3,241	1.4	2,364.2	Urban
17972	11,627	41.0	283.9	Rural

17974	344	0.1	5,057.2	Urban
17976	6,937	7.7	904.3	Urban
17978	224	2.8	80.7	Rural
17979	168	1.1	159.1	Rural
17980	3,238	39.8	81.3	Rural
17981	2,751	27.4	100.5	Rural
17982	430	4.9	88.1	Rural
17983	1,620	2.5	645.7	Urban
17985	1,226	26.2	46.7	Rural
18011	5,450	16.5	330.7	Urban
18013	17,802	60.1	296.1	Urban
18014	11,387	33.4	341.3	Urban
18015	32,832	21.2	1,546.0	Urban
18016	0	0.1	0.0	No Population
18017	37,549	16.2	2,315.9	Urban
18018	32,413	5.2	6,290.7	Urban
18020	20,447	13.8	1,478.1	Urban
18030	623	0.4	1,388.5	Urban
18031	7,528	13.8	546.8	Urban
18032	9,285	2.0	4,624.4	Urban
18034	8,256	11.3	728.4	Urban
18035	241	0.4	686.2	Urban
18036	12,822	29.3	437.6	Urban
18037	7,070	7.3	969.2	Urban
18038	3,091	13.0	238.0	Rural
18040	15,742	16.9	929.3	Urban
18041	5,424	13.9	390.6	Urban
18042	41,570	21.2	1,964.1	Urban
18045	26,391	18.5	1,427.9	Urban

18046	64	0.0	3,507.4	Urban
18049	17,341	15.0	1,156.3	Urban
18051	3,327	8.4	397.9	Urban
18052	26,902	12.7	2,123.7	Urban
18053	2,375	16.4	144.7	Rural
18054	4,278	16.4	260.9	Rural
18055	11,780	21.4	549.8	Urban
18056	943	1.7	562.0	Urban
18058	9,464	51.6	183.2	Rural
18059	1,228	1.6	767.7	Urban
18062	24,351	21.3	1,143.2	Urban
18063	548	1.0	546.0	Urban
18064	24,073	38.4	626.7	Urban
18066	6,005	45.7	131.5	Rural
18067	17,852	24.9	716.2	Urban
18068	42	0.0	10,389.6	Urban
18069	8,017	13.8	580.2	Urban
18070	739	2.4	310.0	Urban
18071	10,578	30.5	346.9	Urban
18072	6,571	15.1	435.9	Urban
18073	9,350	19.1	488.8	Urban
18074	5,775	18.9	305.8	Urban
18076	2,662	1.2	2,217.6	Urban
18077	2,370	14.6	162.6	Rural
18078	7,074	15.8	448.9	Urban
18079	436	0.2	1,850.1	Urban
18080	11,456	30.7	372.8	Urban
18081	357	0.5	677.6	Urban
18083	530	0.6	865.0	Urban

18085	1,119	0.5	2,192.2	Urban
18086	398	0.5	837.7	Urban
18087	738	1.1	666.6	Urban
18088	8,375	19.4	431.7	Urban
18091	5,926	15.4	385.0	Urban
18092	3,223	15.0	215.4	Rural
18101	3,897	0.3	11,166.1	Urban
18102	49,779	3.0	16,610.0	Urban
18103	45,336	17.6	2,574.5	Urban
18104	43,236	23.1	1,871.7	Urban
18105	12	0.0	1,558.1	Urban
18106	6,889	8.1	849.8	Urban
18109	16,932	8.2	2,065.7	Urban
18195	0	0.0	0.0	No Population
18201	27,516	21.5	1,277.8	Urban
18202	12,083	32.7	369.7	Urban
18210	8,258	31.3	263.9	Rural
18211	1,304	21.3	61.1	Rural
18212	131	1.7	76.7	Rural
18214	2,078	23.9	86.9	Rural
18216	1,067	5.2	206.4	Rural
18218	2,281	2.2	1,048.5	Urban
18219	1,436	0.8	1,738.9	Urban
18220	344	0.9	374.2	Urban
18221	389	2.0	196.8	Rural
18222	9,020	37.5	240.2	Rural
18223	115	1.2	92.2	Rural
18224	6,017	15.9	377.4	Urban
18225	114	0.0	2,651.8	Urban

18229	8,498	62.1	136.9	Rural
18230	132	2.7	48.5	Rural
18231	535	1.0	539.1	Urban
18232	3,941	1.5	2,565.2	Urban
18234	401	0.3	1,549.0	Urban
18235	19,353	79.2	244.4	Rural
18237	3,110	6.5	479.3	Urban
18239	232	0.3	861.4	Urban
18240	3,891	29.5	132.0	Rural
18241	646	2.3	275.7	Rural
18242	235	1.3	186.5	Rural
18244	402	1.0	421.9	Urban
18245	348	3.6	96.5	Rural
18246	143	2.1	67.4	Rural
18248	631	14.4	43.8	Rural
18249	4,129	31.9	129.3	Rural
18250	3,034	8.7	349.1	Urban
18251	46	0.1	433.2	Urban
18252	11,188	59.1	189.2	Rural
18254	871	1.8	493.3	Urban
18255	4,337	73.1	59.3	Rural
18256	359	1.1	330.3	Urban
18301	28,561	39.5	723.9	Urban
18302	17,362	61.9	280.5	Rural
18321	1,711	2.7	624.3	Urban
18322	2,781	6.9	403.1	Urban
18323	275	1.9	147.9	Rural
18324	9,714	45.7	212.7	Rural
18325	2,465	43.0	57.3	Rural

18326	4,152	33.3	124.7	Rural
18327	700	1.9	373.0	Urban
18328	7,759	83.3	93.2	Rural
18330	8,927	16.4	544.5	Urban
18331	867	3.4	253.0	Rural
18332	3,085	13.9	221.8	Rural
18333	712	2.1	331.5	Urban
18334	4,156	21.8	190.7	Rural
18335	672	0.9	748.4	Urban
18336	4,082	14.0	292.1	Urban
18337	14,572	78.9	184.6	Rural
18340	174	3.1	56.1	Rural
18342	492	1.1	447.8	Urban
18343	3,982	22.2	179.3	Rural
18344	3,589	7.0	511.3	Urban
18346	2,964	11.0	268.6	Rural
18347	3,364	27.0	124.4	Rural
18349	132	1.4	94.1	Rural
18350	1,931	22.2	87.1	Rural
18351	518	0.4	1,406.8	Urban
18352	1,098	3.8	292.2	Urban
18353	12,779	47.2	271.0	Rural
18354	951	3.4	280.9	Rural
18355	1,492	7.2	208.5	Rural
18356	136	0.7	209.1	Rural
18357	104	4.0	26.1	Rural
18360	28,362	79.4	357.4	Urban
18370	1,096	5.2	210.3	Rural
18371	747	3.5	211.6	Rural

18372	3,210	8.8	363.4	Urban
18403	7,087	23.8	297.9	Urban
18405	2,561	36.9	69.4	Rural
18407	13,862	41.9	331.0	Urban
18411	21,985	54.3	404.6	Urban
18413	151	0.9	168.7	Rural
18414	5,452	42.1	129.6	Rural
18415	1,245	32.9	37.8	Rural
18417	1,121	58.5	19.2	Rural
18419	4,634	38.7	119.9	Rural
18420	57	0.3	203.2	Rural
18421	4,754	35.2	135.0	Rural
18424	5,613	82.5	68.0	Rural
18425	1,354	22.5	60.3	Rural
18426	4,526	59.1	76.5	Rural
18427	118	0.7	173.2	Rural
18428	12,012	166.0	72.4	Rural
18430	33	1.8	18.6	Rural
18431	12,666	134.3	94.3	Rural
18433	6,508	27.7	234.7	Rural
18434	4,192	6.6	630.9	Urban
18435	795	9.9	80.2	Rural
18436	13,853	90.9	152.5	Rural
18437	211	11.8	17.8	Rural
18438	1,172	7.4	159.4	Rural
18439	500	30.5	16.4	Rural
18441	289	2.9	99.0	Rural
18443	458	13.7	33.4	Rural
18444	13,778	117.1	117.6	Rural

18445	2,329	36.4	63.9	Rural
18446	3,733	50.8	73.5	Rural
18447	10,548	20.5	514.3	Urban
18451	448	4.9	91.2	Rural
18452	4,802	2.0	2,441.3	Urban
18453	1,104	50.6	21.8	Rural
18454	64	2.7	23.7	Rural
18455	105	4.5	23.5	Rural
18456	423	4.7	89.1	Rural
18457	82	0.5	170.6	Rural
18458	3,017	54.5	55.4	Rural
18459	51	0.1	764.1	Urban
18460	184	3.3	55.6	Rural
18461	404	21.4	18.9	Rural
18462	427	26.8	15.9	Rural
18463	199	2.9	69.7	Rural
18464	1,193	12.0	99.1	Rural
18465	1,340	47.1	28.5	Rural
18466	16,681	36.0	463.9	Urban
18469	357	9.3	38.5	Rural
18470	2,226	61.5	36.2	Rural
18471	685	2.8	247.9	Rural
18472	7,521	64.1	117.4	Rural
18473	495	1.2	397.4	Urban
18503	1,182	0.5	2,552.4	Urban
18504	21,265	8.6	2,466.7	Urban
18505	20,586	8.5	2,419.2	Urban
18507	4,891	9.7	502.7	Urban
18508	12,292	6.8	1,806.8	Urban

18509	13,589	2.9	4,733.9	Urban
18510	14,119	2.1	6,586.5	Urban
18512	12,218	11.2	1,091.6	Urban
18517	5,274	4.2	1,257.5	Urban
18518	8,313	4.0	2,057.5	Urban
18519	5,104	2.4	2,119.8	Urban
18602	257	1.9	132.6	Rural
18603	19,320	51.6	374.7	Urban
18610	5,008	30.2	166.0	Rural
18612	18,051	53.9	334.9	Urban
18614	2,426	137.9	17.6	Rural
18615	1,867	18.3	101.9	Rural
18616	738	55.3	13.3	Rural
18617	1,924	6.1	317.8	Urban
18618	3,793	17.7	214.5	Rural
18619	273	34.5	7.9	Rural
18621	6,248	44.4	140.6	Rural
18622	257	3.7	70.0	Rural
18623	2,733	56.4	48.5	Rural
18624	718	16.1	44.7	Rural
18625	491	0.8	643.9	Urban
18626	516	25.6	20.2	Rural
18628	192	20.4	9.4	Rural
18629	1,801	93.4	19.3	Rural
18630	3,556	65.9	54.0	Rural
18631	1,286	1.7	749.2	Urban
18632	409	5.2	78.6	Rural
18634	13,569	14.8	915.0	Urban
18635	3,881	38.2	101.6	Rural

18636	1,438	44.5	32.3	Rural
18640	17,155	28.4	604.8	Urban
18641	6,812	4.4	1,559.7	Urban
18642	4,345	5.4	801.3	Urban
18643	12,908	19.0	678.8	Urban
18644	7,546	16.4	459.9	Urban
18651	8,880	12.1	735.9	Urban
18653	132	0.2	534.1	Urban
18655	6,278	72.2	86.9	Rural
18656	2,195	52.1	42.1	Rural
18657	11,985	123.4	97.1	Rural
18660	3,702	42.5	87.1	Rural
18661	5,730	135.0	42.4	Rural
18701	3,447	0.5	6,450.3	Urban
18702	40,295	69.3	581.4	Urban
18704	31,206	10.0	3,118.3	Urban
18705	14,806	5.5	2,712.6	Urban
18706	16,105	26.5	607.8	Urban
18707	15,557	49.7	312.9	Urban
18708	8,817	16.5	533.6	Urban
18709	2,903	0.8	3,678.2	Urban
18801	8,266	162.4	50.9	Rural
18810	6,162	46.0	134.1	Rural
18812	1,644	31.5	52.2	Rural
18814	156	0.6	267.3	Rural
18816	128	1.2	110.0	Rural
18817	306	1.8	166.2	Rural
18818	1,394	45.7	30.5	Rural
18821	1,153	3.5	333.8	Urban

18822	3,642	41.6	87.6	Rural
18823	193	2.7	72.4	Rural
18824	1,401	29.9	46.9	Rural
18825	111	3.3	33.5	Rural
18826	1,910	45.6	41.8	Rural
18828	352	10.0	35.1	Rural
18829	868	25.8	33.6	Rural
18830	735	24.1	30.5	Rural
18831	1,039	29.2	35.6	Rural
18832	1,874	59.6	31.4	Rural
18833	2,056	106.4	19.3	Rural
18834	3,691	66.4	55.6	Rural
18837	3,267	90.1	36.2	Rural
18840	10,731	45.0	238.3	Rural
18842	278	4.1	67.5	Rural
18843	277	0.9	316.0	Urban
18844	1,870	34.2	54.7	Rural
18845	297	9.7	30.7	Rural
18846	847	26.9	31.4	Rural
18847	6,024	141.1	42.7	Rural
18848	9,193	106.0	86.7	Rural
18850	2,357	60.2	39.2	Rural
18851	706	28.0	25.2	Rural
18853	4,252	102.4	41.5	Rural
18854	1,510	26.5	56.9	Rural
18901	27,598	20.2	1,369.4	Urban
18902	20,973	27.8	753.9	Urban
18912	39	0.4	98.2	Rural
18913	185	1.5	125.8	Rural

18914	21,063	17.7	1,187.0	Urban
18915	1,063	1.1	1,009.6	Urban
18917	2,158	0.6	3,702.4	Urban
18920	361	2.7	132.3	Rural
18923	998	1.7	574.1	Urban
18925	6,195	10.7	576.8	Urban
18929	9,306	8.1	1,145.4	Urban
18930	2,721	22.3	121.9	Rural
18932	388	1.3	308.9	Urban
18935	116	0.1	1,612.4	Urban
18936	4	0.7	5.5	Rural
18938	13,989	40.9	341.8	Urban
18940	28,825	32.7	882.0	Urban
18942	3,260	22.5	145.1	Rural
18944	24,479	46.2	529.9	Urban
18947	6,172	23.9	258.1	Rural
18950	252	1.2	216.9	Rural
18951	34,651	66.6	520.1	Urban
18954	9,745	6.7	1,444.7	Urban
18955	1,662	2.6	631.0	Urban
18960	12,473	19.3	647.6	Urban
18962	515	0.2	2,162.4	Urban
18964	13,812	9.3	1,477.3	Urban
18966	37,999	16.2	2,342.1	Urban
18969	15,273	16.9	901.5	Urban
18970	696	0.4	1,708.6	Urban
18972	3,512	23.5	149.2	Rural
18974	40,953	19.1	2,147.0	Urban
18976	19,795	10.8	1,827.4	Urban

18977	4,291	5.2	820.8	Urban
18980	510	2.4	214.6	Rural
19001	17,020	3.5	4,915.5	Urban
19002	32,412	20.8	1,560.4	Urban
19003	12,519	1.9	6,446.7	Urban
19004	9,416	2.8	3,407.4	Urban
19006	21,423	12.8	1,668.6	Urban
19007	21,125	6.8	3,098.5	Urban
19008	20,535	6.6	3,132.3	Urban
19009	864	1.3	664.2	Urban
19010	21,103	8.4	2,503.7	Urban
19012	6,670	1.8	3,795.5	Urban
19013	35,130	5.7	6,138.9	Urban
19014	21,206	9.0	2,357.0	Urban
19015	16,632	3.3	5,072.9	Urban
19017	348	0.9	391.0	Urban
19018	23,360	2.7	8,637.0	Urban
19020	55,493	17.2	3,219.7	Urban
19021	10,074	3.4	2,951.1	Urban
19022	3,669	1.3	2,788.2	Urban
19023	22,164	2.0	11,097.6	Urban
19025	5,395	3.0	1,799.8	Urban
19026	30,738	3.6	8,488.5	Urban
19027	19,067	4.0	4,823.6	Urban
19029	3,971	2.3	1,717.8	Urban
19030	12,122	4.5	2,676.9	Urban
19031	4,700	2.9	1,636.0	Urban
19032	6,606	1.0	6,502.3	Urban
19033	7,777	1.1	7,052.3	Urban

19034	5,999	6.2	960.6	Urban
19035	3,780	4.8	794.1	Urban
19036	12,942	1.5	8,465.3	Urban
19038	31,595	7.9	4,010.3	Urban
19040	20,536	5.9	3,466.7	Urban
19041	6,248	3.3	1,892.1	Urban
19043	2,664	0.4	6,729.8	Urban
19044	15,853	8.1	1,954.3	Urban
19046	17,809	6.6	2,688.9	Urban
19047	35,056	17.5	2,004.4	Urban
19050	28,073	3.7	7,619.6	Urban
19053	25,966	10.5	2,476.4	Urban
19054	17,437	4.1	4,213.8	Urban
19055	13,924	2.8	4,890.3	Urban
19056	15,486	3.7	4,210.7	Urban
19057	17,191	4.4	3,890.1	Urban
19060	11,368	7.8	1,448.4	Urban
19061	19,997	7.0	2,850.2	Urban
19063	35,704	23.1	1,547.2	Urban
19064	24,459	8.0	3,072.5	Urban
19066	5,864	1.4	4,296.8	Urban
19067	51,334	28.5	1,800.9	Urban
19070	7,277	1.1	6,713.4	Urban
19072	9,539	3.2	2,947.0	Urban
19073	18,332	20.7	885.6	Urban
19074	5,890	0.8	7,579.0	Urban
19075	7,354	2.3	3,254.4	Urban
19076	6,525	0.7	8,754.2	Urban
19078	11,067	2.0	5,472.2	Urban

19079	9,168	1.8	4,964.4	Urban
19081	10,337	2.2	4,627.1	Urban
19082	40,997	2.6	15,831.0	Urban
19083	35,878	5.6	6,456.8	Urban
19085	8,932	6.0	1,477.9	Urban
19086	11,420	3.9	2,963.9	Urban
19087	32,225	16.0	2,018.5	Urban
19090	18,832	5.4	3,504.6	Urban
19094	4,406	0.8	5,491.9	Urban
19095	7,063	2.1	3,306.1	Urban
19096	13,572	3.5	3,873.4	Urban
19102	4,705	0.2	24,913.8	Urban
19103	21,908	0.6	34,284.4	Urban
19104	51,808	3.0	17,231.7	Urban
19106	11,740	0.8	14,527.2	Urban
19107	14,875	0.5	27,084.9	Urban
19109	0	0.0	0.0	No Population
19111	63,090	4.8	13,058.5	Urban
19112	13	1.7	7.5	Rural
19113	120	3.5	34.7	Rural
19114	30,907	5.6	5,519.7	Urban
19115	33,207	5.6	5,915.1	Urban
19116	33,112	5.0	6,616.1	Urban
19118	9,808	3.2	3,074.9	Urban
19119	27,035	3.2	8,352.7	Urban
19120	68,104	3.4	20,009.3	Urban
19121	36,572	2.2	16,539.9	Urban
19122	21,653	1.3	17,059.8	Urban
19123	13,416	1.3	10,614.6	Urban

19124	66,691	4.9	13,680.7	Urban
19125	22,958	1.4	16,683.3	Urban
19126	15,758	1.1	13,789.0	Urban
19127	5,913	0.5	10,758.1	Urban
19128	35,239	7.1	4,988.0	Urban
19129	10,975	2.2	4,991.6	Urban
19130	24,870	1.3	19,213.3	Urban
19131	43,172	5.3	8,180.8	Urban
19132	36,268	2.2	16,756.6	Urban
19133	26,063	1.3	20,038.3	Urban
19134	60,675	3.5	17,295.4	Urban
19135	33,091	2.3	14,210.8	Urban
19136	40,647	4.6	8,827.3	Urban
19137	8,638	2.4	3,587.8	Urban
19138	32,273	1.7	18,731.0	Urban
19139	41,271	1.8	23,316.9	Urban
19140	54,133	3.1	17,735.5	Urban
19141	31,376	1.8	17,300.5	Urban
19142	29,595	1.7	17,553.8	Urban
19143	64,849	3.2	20,342.3	Urban
19144	43,329	3.4	12,620.6	Urban
19145	47,261	4.9	9,711.2	Urban
19146	35,113	1.7	20,782.0	Urban
19147	36,228	1.4	25,741.2	Urban
19148	49,732	4.2	11,776.7	Urban
19149	55,006	2.4	22,648.4	Urban
19150	23,378	1.5	15,506.4	Urban
19151	29,883	2.4	12,494.5	Urban
19152	33,293	2.8	11,811.5	Urban

19153	12,259	7.2	1,712.8	Urban
19154	34,196	6.3	5,397.4	Urban
19301	6,402	3.4	1,904.7	Urban
19310	3,066	13.0	235.4	Rural
19311	8,584	12.6	681.6	Urban
19312	11,539	9.5	1,217.4	Urban
19316	186	0.9	208.8	Rural
19317	9,530	21.1	451.5	Urban
19319	1,130	0.6	1,785.8	Urban
19320	52,342	84.5	619.3	Urban
19330	5,421	33.7	160.9	Rural
19333	6,895	3.5	1,997.2	Urban
19335	46,984	42.5	1,104.7	Urban
19341	16,709	12.9	1,295.3	Urban
19342	18,099	19.5	928.1	Urban
19343	8,142	27.1	300.5	Urban
19344	11,919	32.6	365.2	Urban
19345	689	0.2	3,408.4	Urban
19348	22,232	37.0	600.5	Urban
19350	10,921	27.9	392.0	Urban
19352	10,622	19.2	553.5	Urban
19355	24,760	38.4	645.5	Urban
19358	526	0.3	1,677.1	Urban
19362	5,815	30.2	192.7	Rural
19363	17,055	49.8	342.7	Urban
19365	7,006	17.9	392.0	Urban
19367	171	0.2	1,011.8	Urban
19372	1,360	0.6	2,327.8	Urban
19373	4,273	4.1	1,031.4	Urban

19374	1,252	1.7	727.9	Urban
19375	104	0.4	252.1	Rural
19380	49,534	31.5	1,570.1	Urban
19382	52,388	46.3	1,131.9	Urban
19383	3,169	0.1	52,884.2	Urban
19390	13,425	26.1	514.2	Urban
19401	41,753	6.0	6,922.3	Urban
19403	44,260	23.7	1,865.1	Urban
19405	5,127	0.7	7,087.5	Urban
19406	23,441	13.8	1,695.5	Urban
19422	18,506	12.7	1,458.4	Urban
19425	13,922	26.9	516.7	Urban
19426	38,831	33.9	1,145.4	Urban
19428	16,580	7.6	2,181.5	Urban
19435	100	0.8	128.8	Rural
19436	640	0.4	1,825.2	Urban
19437	757	1.1	692.7	Urban
19438	23,765	22.3	1,065.3	Urban
19440	18,038	11.3	1,600.6	Urban
19442	45	0.0	2,281.8	Urban
19444	10,519	4.8	2,171.5	Urban
19446	55,138	22.6	2,444.8	Urban
19453	1,483	0.7	2,251.3	Urban
19454	27,870	13.1	2,135.5	Urban
19456	737	0.4	1,798.7	Urban
19457	125	0.2	634.9	Urban
19460	40,154	35.4	1,135.7	Urban
19462	14,658	8.5	1,731.5	Urban
19464	45,788	25.4	1,804.0	Urban

19465	17,038	35.8	476.0	Urban
19468	25,536	16.4	1,558.3	Urban
19472	74	0.2	439.0	Urban
19473	15,726	24.5	640.6	Urban
19474	733	0.2	3,769.9	Urban
19475	11,283	16.5	681.9	Urban
19477	146	0.1	2,860.3	Urban
19492	717	1.2	610.7	Urban
19501	1,047	1.0	1,037.8	Urban
19503	1,142	1.5	763.6	Urban
19504	4,998	22.5	221.9	Rural
19505	3,226	8.9	364.2	Urban
19506	7,356	67.9	108.3	Rural
19507	3,280	37.7	87.0	Rural
19508	15,725	38.0	413.5	Urban
19510	7,639	5.6	1,366.5	Urban
19511	215	0.3	685.2	Urban
19512	16,954	43.3	391.2	Urban
19518	14,734	36.1	407.6	Urban
19519	101	0.1	870.3	Urban
19520	5,465	37.3	146.4	Rural
19522	14,229	44.9	316.6	Urban
19523	250	1.4	176.3	Rural
19525	14,107	16.9	833.3	Urban
19526	11,039	57.8	191.1	Rural
19529	3,131	58.1	53.9	Rural
19530	16,432	55.8	294.4	Urban
19533	7,686	17.9	429.0	Urban
19534	2,041	20.1	101.5	Rural

19535	23	0.0	502.9	Urban
19536	490	0.4	1,268.5	Urban
19538	64	0.5	132.9	Rural
19539	4,597	22.1	207.8	Rural
19540	11,723	34.0	344.6	Urban
19541	4,403	22.4	196.8	Rural
19542	67	0.0	1,442.3	Urban
19543	5,905	22.2	266.5	Rural
19544	196	0.2	1,171.2	Urban
19545	428	0.4	959.5	Urban
19547	4,222	28.6	147.7	Rural
19549	326	1.4	234.0	Rural
19550	641	1.6	396.8	Urban
19551	5,034	24.9	202.4	Rural
19554	374	0.5	826.1	Urban
19555	3,406	13.6	249.8	Rural
19559	362	0.3	1,279.5	Urban
19560	7,805	8.1	960.4	Urban
19562	2,622	1.0	2,581.0	Urban
19564	90	0.2	436.3	Urban
19565	8,531	19.1	446.8	Urban
19567	5,388	22.6	238.7	Rural
19601	32,998	3.7	8,891.6	Urban
19602	17,900	2.5	7,243.1	Urban
19604	27,658	2.2	12,596.2	Urban
19605	18,985	16.7	1,133.5	Urban
19606	34,416	27.5	1,251.5	Urban
19607	22,544	11.2	2,014.8	Urban
19608	22,719	25.7	884.6	Urban

19609	9,946	2.5	3,941.0	Urban
19610	15,258	7.0	2,173.8	Urban
19611	10,589	2.0	5,231.7	Urban

Appendix 3: Rural Vs Urban Results

what is your primary home internet service connection?

COUNT of Q1 – Network Tech	Q1 – Network Tech								
Rural/Urban Status	1	2	3	4	5	6	7	8	Grand Total
Rural	18.84%	18.60%	34.42%	6.28%	7.21%	2.56%	3.49%	8.60%	100.00%
Urban	6.13%	6.72%	54.35%	1.88%	6.72%	17.09%	1.78%	5.34%	100.00%
#N/A		66.67%	33.33%						100.00%
Grand Total	**9.90%**	**10.38%**	**48.37%**	**3.18%**	**6.85%**	**12.73%**	**2.28%**	**6.30%**	**100.00%**

how much does your household pay for home Internet service?
1) less than $20/month 2) $21-40 / month 3) $41 - 60 / month
4) $61 - 80/month 5) $81-100/month 6)$101-120 / month
7) more than $120 / month 8) Free 9) Not sure

COUNT of Q2	Q2																																
	1				2				3				4				5				6				7				Grand Total
Rural/Urban Status	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4					
Rural	2.29%	0.92%	0.46%	0.46%	7.80%	5.50%	2.29%	1.83%	8.72%	5.05%	7.80%	1.38%	5.50%	3.67%	7.80%	0.46%	2.29%	4.13%	8.26%	5.05%	1.83%		3.21%	2.29%	3.21%	0.92%	3.67%	3.21%	100.00%				
Urban	1.22%	0.61%	1.43%	0.81%	0.20%	2.85%	2.85%	1.83%	2.44%	3.87%	9.98%	5.30%	1.02%	2.85%	9.78%	8.76%	0.61%	2.65%	6.31%	8.76%	0.41%	1.63%	3.67%	3.67%	0.61%	1.02%	6.11%	8.76%	100.00%				
Grand Total	**1.55%**	**0.71%**	**1.13%**	**0.71%**	**2.54%**	**3.67%**	**2.68%**	**1.83%**	**4.37%**	**4.23%**	**9.31%**	**4.09%**	**2.40%**	**3.10%**	**9.17%**	**6.21%**	**1.13%**	**3.10%**	**6.91%**	**7.62%**	**0.85%**	**1.13%**	**3.53%**	**3.24%**	**1.41%**	**0.99%**	**5.36%**	**7.05%**	**100.00%**				

part of a bundle purchased together with cable TV or phone service?

COUNT of Q3	Q3																																
Rural/Urban Status	1	2	3	Grand Total				17.43%				22.94%				17.43%				19.72%				7.34%				11.01%					
Rural	54.85%	39.80%	5.36%	100.00%				7.74%				21.59%				22.40%				18.33%				9.37%				16.50%					
Urban	59.60%	34.24%	6.16%	100.00%																													
#N/A	66.67%	33.33%		100.00%																													
Grand Total	**58.24%**	**35.85%**	**5.91%**	**100.00%**																													

what is the download speed of your current home Internet service?
1) 0-10mpbs
2) 10-25 mpbs
3) 25-100 mbps
4) 100+ mbps
5) unsure

COUNT of Q4	Q4						
Rural/Urban Status	1	2	3	4	5	6	Grand Total
Rural	17.56%	11.70%	18.58%	9.16%	43.00%		100.00%
Urban	3.55%	8.14%	21.92%	20.88%	45.41%	0.10%	100.00%
#N/A		33.33%			66.67%		100.00%
Grand Total	**7.61%**	**9.23%**	**20.90%**	**17.43%**	**44.76%**	**0.07%**	**100.00%**

How interested would you be in subscribing to a 25 Megabits per second broadband internet service if it were free?

COUNT of Q5	Q5				
Rural/Urban Status	1	2	3	4	Grand Total
Rural	40.66%	20.20%	10.61%	28.54%	100.00%
Urban	28.06%	21.88%	14.43%	35.62%	100.00%
#N/A		33.33%		66.67%	100.00%
Grand Total	**31.92%**	**21.38%**	**13.21%**	**33.49%**	**100.00%**

Interest @ < $20/month?

COUNT of Q6	Q6				
Rural/Urban Status	1	2	3	4	Grand Total
Rural	30.38%	22.78%	13.42%	33.42%	100.00%
Urban	19.63%	21.59%	16.74%	42.03%	100.00%
#N/A		33.33%		66.67%	100.00%
Grand Total	**22.94%**	**21.99%**	**15.66%**	**39.40%**	**100.00%**

Interest @ 20-40?

COUNT of Q7	Q7				
Rural/Urban Status	1	2	3	4	Grand Total
Rural	15.66%	19.19%	21.21%	43.94%	100.00%
Urban	8.80%	18.06%	18.98%	54.17%	100.00%
#N/A		33.33%		66.67%	100.00%
Grand Total	**10.93%**	**18.45%**	**19.64%**	**50.99%**	**100.00%**

Interest @ 40-60?

COUNT of Q8	Q8				
Rural/Urban Status	1	2	3	4	Grand Total
Rural	7.16%	11.76%	22.51%	58.57%	100.00%
Urban	4.51%	10.17%	20.35%	64.97%	100.00%
#N/A		33.33%		66.67%	100.00%
Grand Total	**5.32%**	**10.72%**	**20.97%**	**62.99%**	**100.00%**

Interest @ 60-80?

COUNT of Q9	Q9				
Rural/Urban Status	1	2	3	4	Grand Total
Rural	1.55%	5.67%	17.78%	75.00%	100.00%
Urban	1.73%	4.72%	18.55%	75.00%	100.00%
#N/A			33.33%	66.67%	100.00%
Grand Total	**1.67%**	**5.00%**	**18.35%**	**74.98%**	**100.00%**

Interest @ 80-100?

COUNT of Q10	Q10				
Rural/Urban Status	1	2	3	4	Grand Total
Rural	0.76%	1.77%	13.67%	83.80%	100.00%
Urban	1.03%	2.73%	13.55%	82.69%	100.00%
#N/A				100.00%	100.00%
Grand Total	**0.94%**	**2.43%**	**13.56%**	**83.07%**	**100.00%**

Interest @ 100-120?

COUNT of Q11	Q11				
Rural/Urban Status	1	2	3	4	Grand Total
Rural	1.01%	1.27%	10.38%	87.34%	100.00%
Urban	0.68%	1.70%	10.77%	86.85%	100.00%
#N/A				100.00%	100.00%
Grand Total	**0.78%**	**1.56%**	**10.63%**	**87.03%**	**100.00%**

Interest @ 120+?

COUNT of Q12	Q12				
Rural/Urban Status	1	2	3	4	Grand Total
Rural	1.27%	1.01%	8.10%	89.62%	100.00%
Urban	0.79%	1.58%	8.60%	89.03%	100.00%
#N/A				100.00%	100.00%
Grand Total	**0.94%**	**1.40%**	**8.42%**	**89.24%**	**100.00%**

Gender?

COUNT of Q13	Q13			
Rural/Urban Status	1	2	3	Grand Total
Rural	47.67%	49.77%	2.56%	100.00%
Urban	45.95%	51.58%	2.47%	100.00%
#N/A	33.33%	66.67%		100.00%
Grand Total	**46.44%**	**51.07%**	**2.49%**	**100.00%**

Ethnicity?

COUNT of Q14	Q14						
Rural/Urban Status	1	2	3	4	5	6	Grand Total
Rural	0.97%	26.44%	0.48%	0.76%		1.11%	29.76%

Urban	2.56%	56.26%	1.31%	5.33%	0.62%	3.94%	70.03%	
#N/A		0.21%					0.21%	
Grand Total	**3.53%**	**82.91%**	**1.80%**	**6.09%**	**0.62%**	**5.05%**	**100.00%**	

Age?

COUNT of Q15	*Q15*						
Rural/Urban Status	1	2	3	4	5	Grand Total	
Rural	3.04%	4.01%	5.12%	5.74%	11.83%	29.76%	
Urban	9.97%	13.91%	15.02%	13.70%	17.44%	70.03%	
#N/A			0.07%	0.07%	0.07%	0.21%	
Grand Total	**13.01%**	**17.92%**	**20.21%**	**19.52%**	**29.34%**	**100.00%**	

Rural or Urban?

COUNT of Q16	*Q16*			
Rural/Urban Status	1	2	3	Grand Total
Rural	6.74%	16.98%	76.28%	100.00%
Urban	25.99%	57.91%	16.11%	100.00%
#N/A			100.00%	100.00%
Grand Total	**20.21%**	**45.61%**	**34.19%**	**100.00%**

Education level?

COUNT of Q17	*Q17*							
Rural/Urban Status	1	2	3	4	5	6	7	Grand Total
Rural	0.42%	7.06%	5.61%	3.94%	6.16%	5.40%	1.18%	29.76%
Urban	1.25%	10.73%	11.35%	7.34%	19.79%	18.34%	1.25%	70.03%
#N/A			0.07%	0.07%	0.07%			0.21%
Grand Total	**1.66%**	**17.79%**	**17.02%**	**11.35%**	**26.02%**	**23.74%**	**2.42%**	**100.00%**

Approximate income?

COUNT of Q18	*Q18*								
Rural/Urban Status	1	2	3	4	5	6	7	8	Grand Total
Rural	3.46%	6.02%	4.08%	2.84%	2.84%	1.59%	0.90%	8.03%	29.76%
Urban	5.88%	9.55%	9.00%	8.37%	10.24%	4.84%	5.19%	16.96%	70.03%
#N/A	0.07%	0.07%						0.07%	0.21%
Grand Total	**9.41%**	**15.64%**	**13.08%**	**11.21%**	**13.08%**	**6.44%**	**6.09%**	**25.05%**	**100.00%**

Mode.

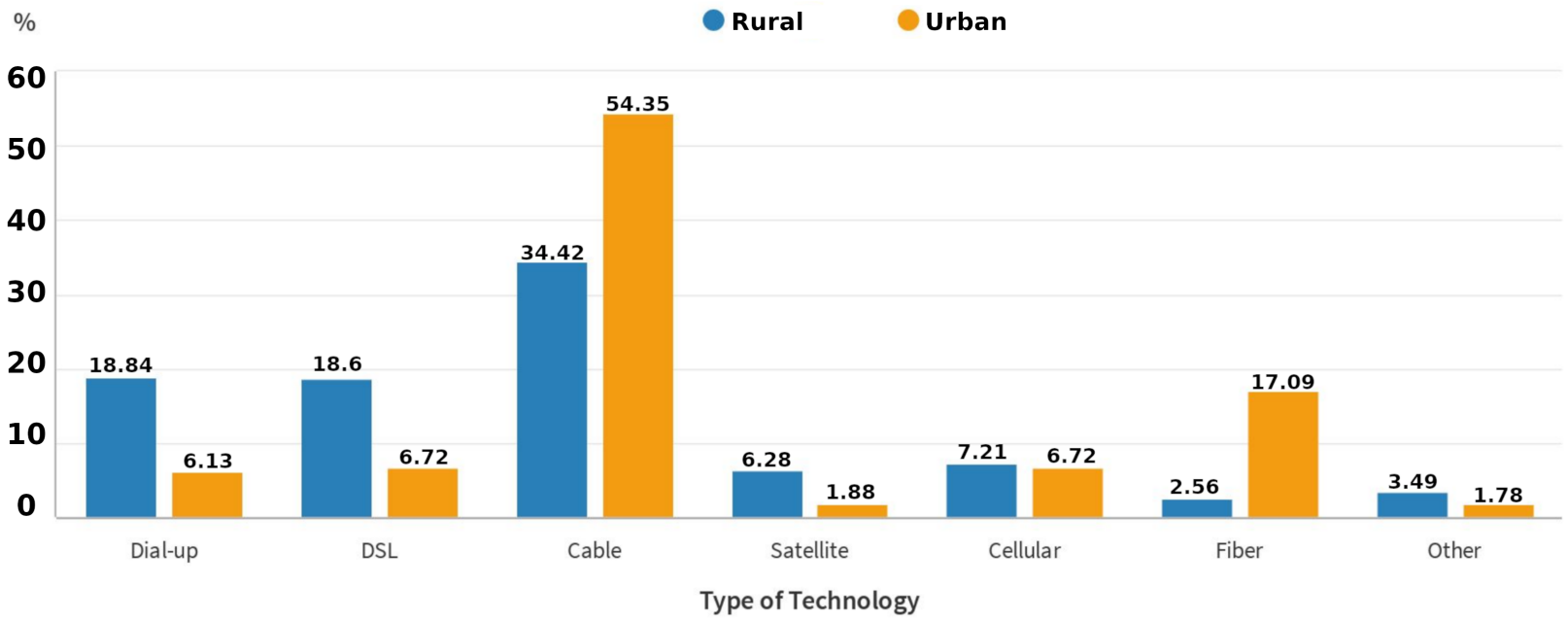
COUNT of Q19	*Q19*		
Rural/Urban Status	1	2	Grand Total
Rural	17.51%	12.25%	29.76%
Urban	21.80%	48.24%	70.03%
#N/A	0.07%	0.14%	0.21%
Grand Total	**39.38%**	**60.62%**	**100.00%**

Media Market

COUNT of Q20	*Q20*							
Rural/Urban Status	1	2	3	4	5	6	7	Grand Total
Rural	2.28%	6.02%	5.40%	0.97%	5.19%	6.71%	3.18%	29.76%
Urban	1.66%	11.14%	2.70%	31.00%	17.85%	5.19%	0.48%	70.03%
#N/A		0.07%			0.07%	0.07%		0.21%
Grand Total	**3.94%**	**17.23%**	**8.10%**	**31.97%**	**23.11%**	**11.97%**	**3.67%**	**100.00%**

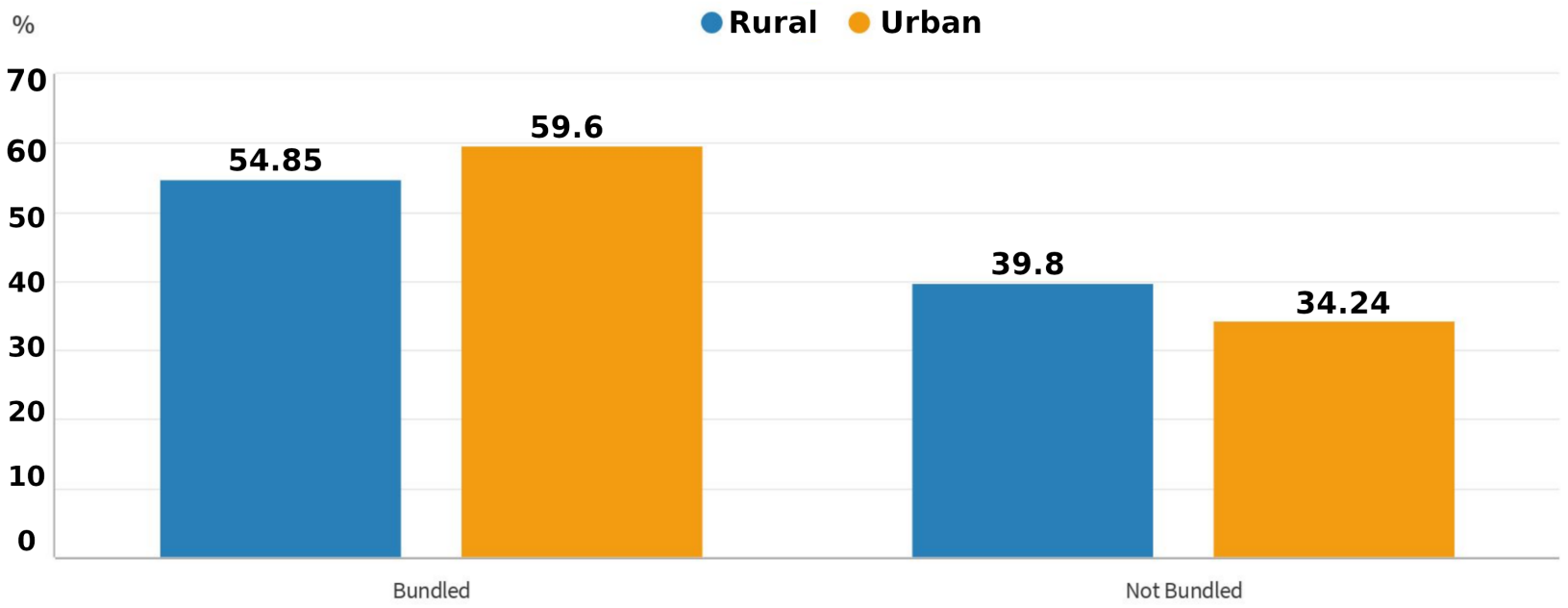
Appendix 4: Graphs

Figure A - Rural vs Urban Breakdown of Types of Connection Technology in Pennsylvania



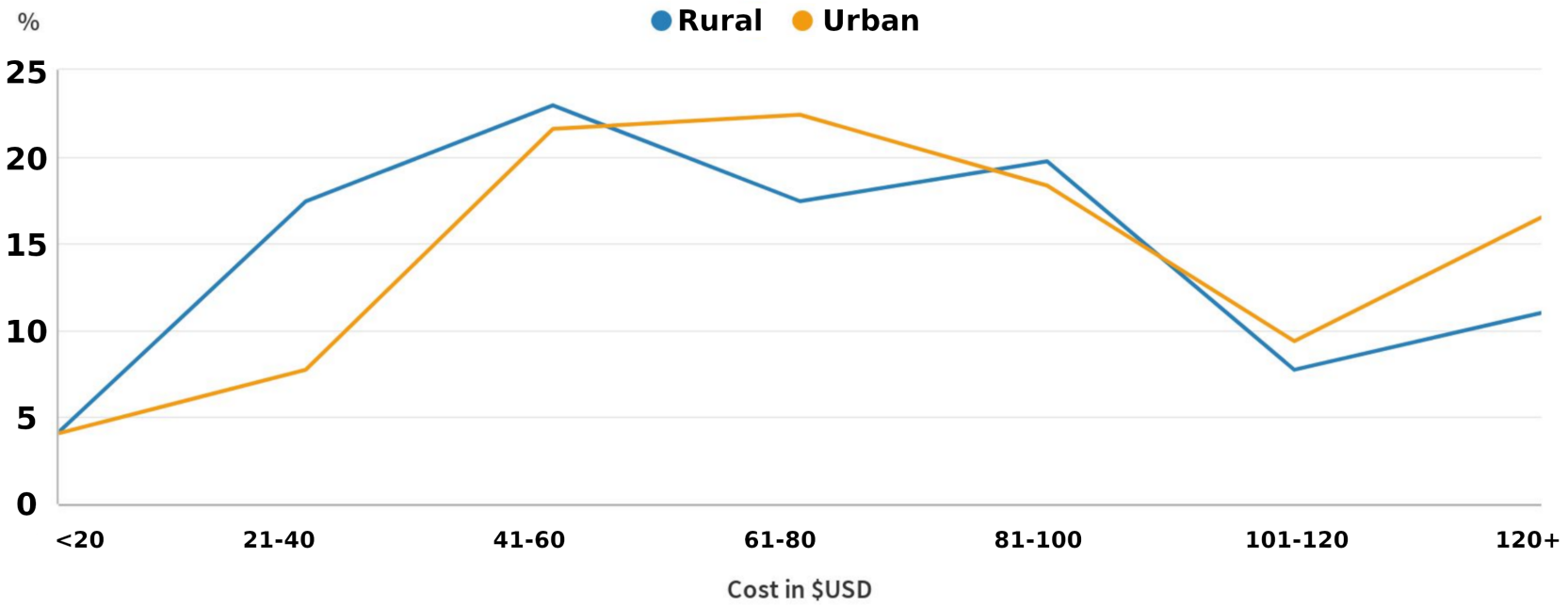
Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure B - Breakdown of bundled / unbundled Internet for Rural and Urban Areas



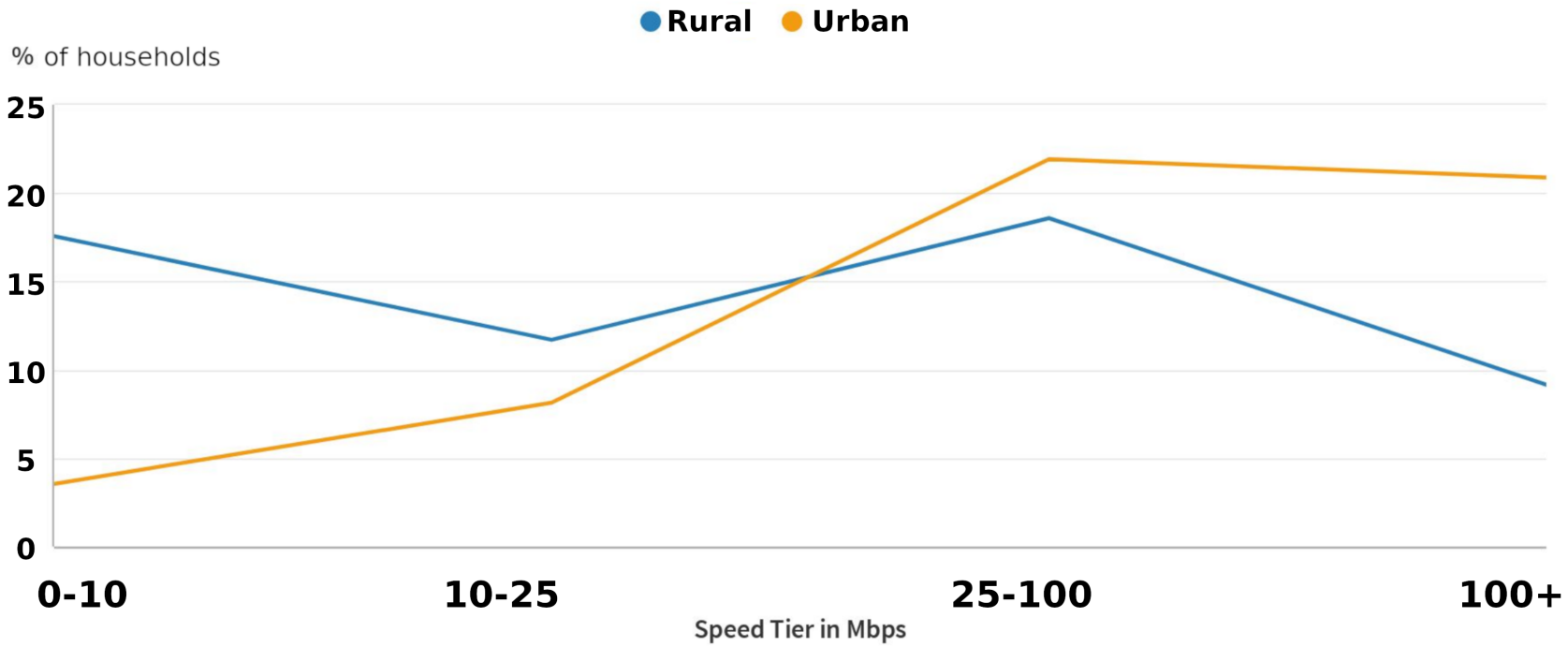
Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure C - Rural vs Urban breakdown of cost for home Internet service



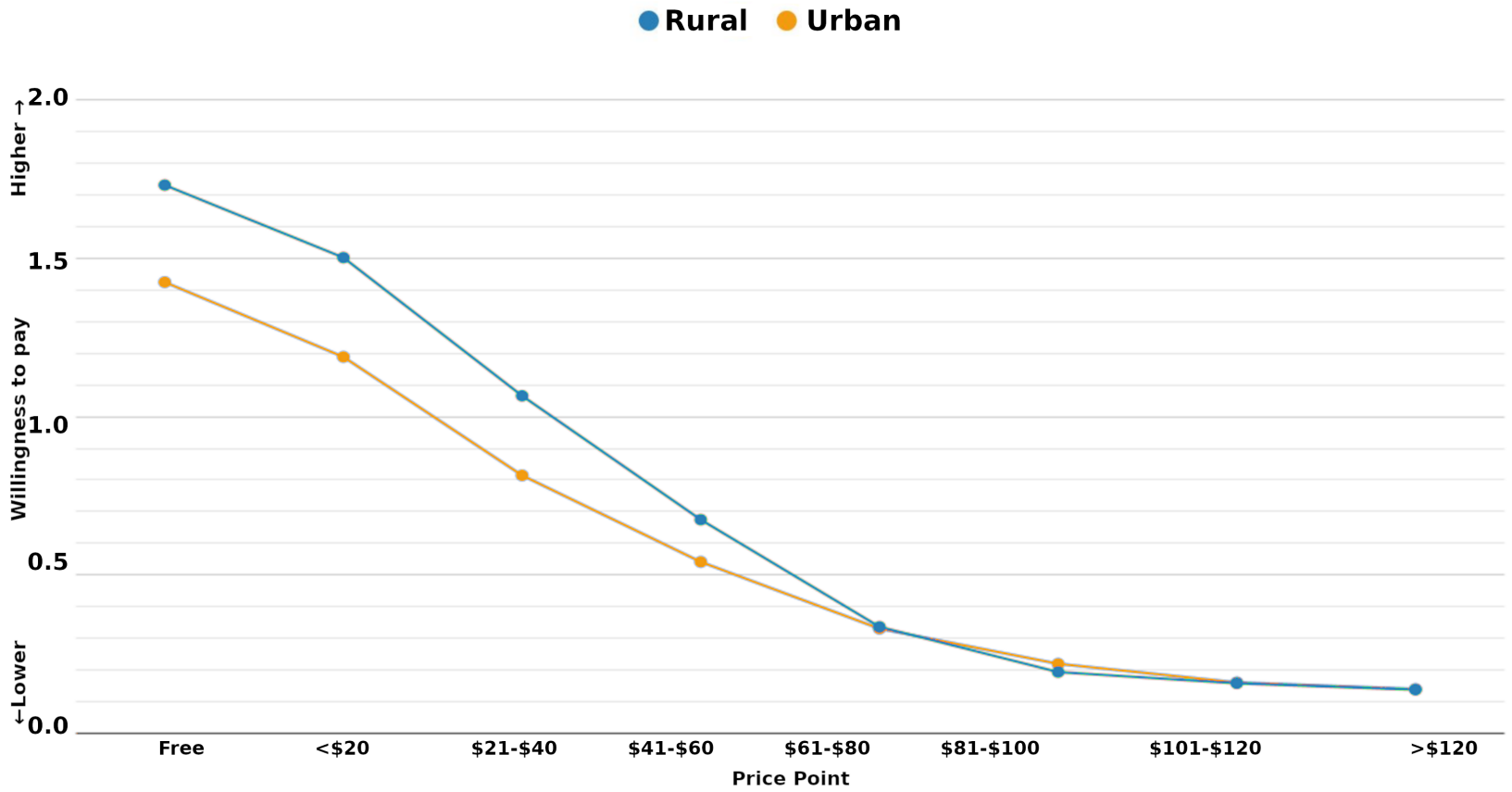
Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure D - Rural vs Urban Broadband Internet Speeds



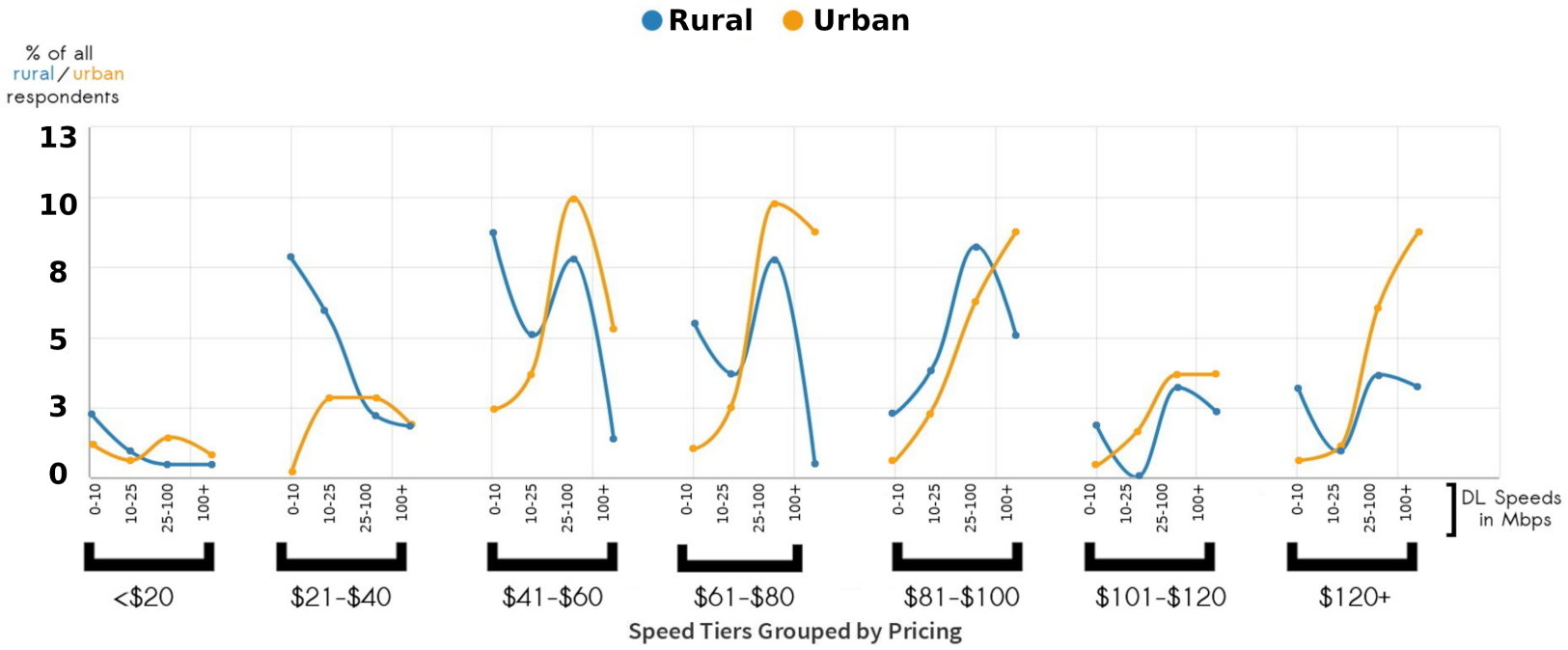
Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure E - Price elasticity of demand curve for Rural and Urban Pennsylvania



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

Figure F - Rural vs Urban Residential Pricing over Speed Tier



Source: Broadband Price Elasticity in Rural Pennsylvania, 2020

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