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August 19, 2019

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Slow internet speed in rural areas does more than stop farmers from buying Netflix subscriptions, and it could be robbing their communities of a chance at financial success. It also has sweeping implications for how people in those areas communicate with their doctors, complete homework assignments for school and search for jobs.

New research strengthens the argument that federal regulators who measure internet speed shouldn't be taking service providers at their word. Annual Federal Communications Commission broadband deployment data, which is supplied by the internet companies, shows that nearly 95% percent of Pennsylvania residents have access to what the government defines as broadband internet service, or download speeds of 25 megabits per second, or Mbps.

A Penn State report, however, finds that fewer than 50 percent of consumers in each Pennsylvania county have speeds of 25 Mbps or greater. The Center for Rural Pennsylvania funded research on internet speeds from ground-based, wired internet connections. A team led by Sascha Meinrath, Penn State's Palmer Chair of Telecommunications and co-creator of Measurement Lab, or M-Lab, **completed the research**, using data M-Lab has collected for years. The team's conclusion rankled the internet industry.

"This report confuses availability and adoption," said Brian Herrmann, spokesman for the **Broadband Cable Association of Pennsylvania**. "Virtually every municipality has broadband cable going by the residences with speeds up to a gig (gigabit per second, or 1,000 Mbps)."

Meinrath scoffs at the industry association's defense. "I don't see how we can be any more clear that we are 100% aware that advertised availability and M-Lab's actual speed measures are two separate data

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sets," he said. M-Lab's data, culled from millions of speed tests in Pennsylvania, shows a yawning gap between what providers say they deliver in rural locales and the connection speeds customers actually receive.

For example: In Meshoppen, Wyoming County, the FCC reported in December 2014 speeds of 3 megabits per second, or Mbps. For that same time period, M-Lab recorded median experienced speeds of 1.88 Mbps. Two years later, in December 2016, the FCC's speeds were posted at 18 Mbps, the report says. Consumer speed tests showed a median speed of 2.74 Mbps in December 2016. Similar scenarios play out in Susquehanna Depot in Susquehanna County; Benton, Columbia County; and Sterling Twp., Wayne County.

In Lackawanna County, the FCC says broadband speeds in June 2017 were available up to 12 Mbps, according to the M-Lab report. Researchers found the median speed at that time was only 5.59 Mbps. In Luzerne County, FCC-reported speeds for that period were 25 Mbps; median speeds per M-Lab's speed tests were only 5.51 Mbps. As far as the FCC is concerned, if a single home within a census tract has access to those speeds, that geographic area is considered to be served.

But that's confusing, Meinrath says. A given area might have high speed access in some places, but that doesn't mean it reaches every home or business modem. "It's the same story if you're in New Mexico or Pennsylvania or Michigan," said Francella Ochillo, executive director at Next Century Cities. The Washington, D.C.-based organization helps cities across the country get reliable, affordable internet access. "This is a story that is replicated throughout the country ... (and) we're at a tipping point where I feel like there's finally a public acknowledgement as well as a political will to change something in the way that we're collecting data."

When government agencies collect bad data, communities that need resources lose out and the money gets funneled toward those who need it less, she said. "The complaints are nearly universal in rural communities," state Sen. Lisa Baker, R-20, Lehman Twp., said in a statement. She's been an advocate for more access in rural areas, especially when it comes to improving health care infrastructure. Advances in rural health lean heavily on telemedecine, which allows doctors to communicate with and treat their patients remotely.

She also points out that economic recovery in rural towns lags behind other places that have stronger infrastructure. "The problem is particularly acute across northern tier counties, where the jobs numbers are showing only slight improvement since the recession, and technology limitations contribute to the slow recovery," she said.

Fast internet is far more important than giving you the "Orange is the New Black" season finale glitch-free. It's become a ubiquitous tool for education, health care and commerce. In developed nations, it touches every facet of human existence. Ochillo says the debate between availability and adoption probably isn't so black and white. "There are couple of layers to that adoption piece that are not only about access and it being available in your area," she said. "I do think that the main barrier remains affordability."

She offered a few other examples:
• Complacency among customers, who have only ever had slow internet speeds and accept what they get.
• Others can't afford the monthly bill or the equipment. Maybe they don't know how to use a computer or hook up a broadband modem.
• Immigrants from countries where they don't trust the government shun technology.

Last week, the FCC announced it would spend over $121 million to connect more than 36,500 homes in unserved rural homes and businesses across 16 states and support the new infrastructure for 10 years. That includes $32.3 million to connect 7,000 homes in Bradford, Lycoming, Potter and Tioga counties — some of Pennsylvania's most remote — with lightning fast speeds of one gigabit per second. "In Pennsylvania, this round of funding takes another step toward closing the digital divide, providing access to digital opportunity to over 7,000 unserved rural homes and businesses," FCC Chairman Ajit Pai said in a statement.

Such an investment could have helped school districts such as Northwest Area, where students' Google Chromebooks were useless without the high-speed service the district installed 10 years ago. Back then, Northwest Area joined other districts in Luzerne Intermediate Unit and Northeastern Educational Intermediate Unit in a project called the Northeastern Pennsylvania Wide Area Network. The private network is bid out through the intermediate units and passed along to participating districts. Service is provided by Frontier Communications.

To take advantage of the WAN, the district built its own infrastructure. Three towers use line-of-sight wireless to connect two elementary schools to the district's broadband internet, which comes through cable to the administration building and high school. Every few years, district officials upgrade the equipment on the towers, said technology Director Adam Sorber. They just improved the tower equipment because the previous equipment couldn't handle the gigabit-per-second speed of the district's internet connection. "If not for that WAN project about a decade ago and us erecting the towers and building our network ourselves, there still would be no solution in place that would be affordable for the district, or even available," Sorber said.

Sorber hears complaints about residential internet service all the time. People who don't like their internet connection can try satellite. But that costs more, and telephone calls made using Wi-Fi — which many people rely on because cell service is so poor — sometimes do not work as well through satellite. "No matter what you way go, there's a hurdle," he said. To accumulate its data, M-Lab collects millions of voluntary user speed tests and finds the median for counties and census tracts.

Herrmann and the FCC contend that speed tests don't account for other factors, including what service package customers choose or whether they have multiple devices connected to the network during the test. Meinrath admitted the opt-in nature of his speed test means users with extremely high or low speeds can skew results, which is why he chose to use the median speed, not the average. "What we have is not a few thousand or a few tens of thousands," he said. "We have 11 million tests run in Pennsylvania in 2018."

One of the world's biggest software companies this year published data supporting the center's report. Microsoft estimates nearly 163 million do not use the internet at broadband speeds. The FCC says only 19 million Americans do not have broadband-speed internet. "I'm not faulting them, and the research doesn't fault them," said Barry Denk, the Center for Rural Pennsylvania's executive director.

The organization is following its June report with another study, again using Meinrath and his team, to determine what customers in rural areas actually want or need. "They're in the business to make money," Denk said of internet providers. "To invest millions of dollars and not be sure of the take rate, and if the take rate's not there and you still have maintenance concerns — it's a hefty price tag."

Frequently asked questions: Rural broadband
Q: What is broadband?
A: It's an internet connection with download speeds of at least 25 megabits per second, or Mbps, and upload speeds of at least 3 Mbps. Here are a few examples of what that gets you.
• Consumers can adequately browse the internet, stream videos from Netflix, play games online and connect multiple devices — all at the same time — at those speeds. You need at least 25 Mbps to stream Ultra HD 4K video, according to the FCC.
• It's more than fast enough to facilitate credit card transactions for small businesses quickly and other commerce functions, including processing orders.
• For comparison's sake, general web browsing and sending email requires about 1 Mbps. The 25-Mbps definition will likely change in the future, as more devices are added to "the internet of things," requiring faster speeds for even routine tasks and activities.

Q: Why is it important for rural communities?
A: Norman J. Kennard, a member of the state Public Utility Commission, testified before a state house caucus on broadband issues that rural broadband reduces health care costs by allowing patients to talk to their doctors without visiting them. Wearable health monitoring devices and mobile testing equipment send vital signs and other information from remote places to physicians instantly. Other benefits include "improving education for children and workers, leading to improved median household incomes and driving down unemployment, stimulating economic growth in communities, saving consumers money with better shopping opportunities, and providing increased farm revenue," Kennard said.

Q: Why don't the FCC's speed numbers match real user experience?
A: Internet service providers tell the FCC what speeds they offer in any given census tract, but that doesn't mean customers are paying for those speeds or that extending cable lines to reach homes and businesses won't cost more. Some lawmakers, researchers and tech companies say this way of measuring speeds is outdated, and it should be updated so the agencies that fund infrastructure improvement know where the problems are.
Q: Why is broadband limited in rural areas?
A: Lower customer density means a higher cost per customer in rural areas for all sorts of infrastructure, including high-speed internet — so internet service providers make less money.

Q: Has the country faced similar infrastructure challenges before?
A: In the 1930s, about 90% of people living in cities had access to electricity, but only about 10% of rural residents did. Private companies were not interested in bringing electricity to rural areas because they thought farmers wouldn't be able to afford the service after it was installed, according to the Roosevelt Institute. The Rural Electrification Act of 1936, part of Franklin D. Roosevelt's New Deal, helped bring electricity to rural America.
Q: I can't get broadband cable to my house. What are my options?
A: Satellite TV companies provide high-speed internet access, but people who use their satellite dishes for internet access have delays in the processing of information transfer and brownouts under cloudy skies. In many cases, it also costs more than a wired connection. Contact your provider and ask what might be available.

Q: What is the government doing about rural broadband access?
A: State and federal governments are investing funds to develop rural broadband internet.
In Pennsylvania, Gov. Tom Wolf launched the Pennsylvania Broadband Investment Incentive Program, which made $35 million of incentive funding available to providers bidding on rural areas. The U.S. Department of Agriculture has made $600 million of grants and loans available for improving rural internet access. Last week, the FCC announced $121 million for broadband infrastructure improvements in 16 states including Pennsylvania – **Various Pennsylvania daily newspapers, including *Wilkes-Barre Citizens' Voice* that included this sidebar**

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