WHAT YOU'RE PAYING FOR

WHAT YOU'RE USING

The Truth About Faster Internet: It's Not Worth It

WSJ testing shows typical U.S. households don't use most of their bandwidth while streaming and get marginal gains from upgrading speeds

By Shalini Ramachandran, Thomas Gryta, Kara Dapena and Patrick Thomas

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Americans are spending ever more for blazing internet speeds, on the promise that faster is better. Is that really the case?

For most people, the answer is no.

The Wall Street Journal studied the internet use of 53 of our journalists across the country, over a period of months, in coordination with researchers at Princeton University and the University of Chicago.

Our panelists used only a fraction of their available bandwidth to watch streaming services including Netflix, Amazon Prime Video and YouTube, even simultaneously. Quality didn't improve much with higher speeds. Picture clarity was about the same. Videos didn't launch quicker.

Related: You Got a 'Free' Internet Speed Upgrade. Then Your Bill Went Up.

Broadband providers such as Comcast Corp., Charter Communications Inc. and AT&T Inc. are marketing speeds in the range of 250, 500 or even 1,000 megabits a second, often promising that streaming-video bingers will benefit. "Fast speeds for all of your shows," declares one online ad from Comcast.

But for a typical household, the benefits of paying for more than 100 megabits a second are marginal at best, according to the researchers. That means many households are paying a premium for services they don't need.

What follows is our evidence that you're being oversold:

MYTH

It's Easy to Max Out Your Bandwidth

THE TRUTH

It's Very Hard to Max Out Your Bandwidth

To gauge how much bandwidth, or speed capacity, households need, it helps to look at an extreme scenario. Our users spent an evening streaming up to seven services simultaneously, including on-demand services like Netflix and live-TV services like Sling TV. We monitored the results.

Peter Loftus, one of our panelists, lives outside Philadelphia and is a Comcast customer with a speed package of 150 megabits a second.

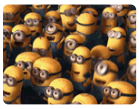
PETER LOFTUS STRESS TEST

Used bandwidth Unused bandwidth

Peter pays for **150 Mbps** →

One afternoon, Peter started watching 'Ferdinand' on HBO Now using an Xbox One.

Next he added 'D
HBO Now using



Then he launched 'The
Turks' on Facebook. He
little blurriness, but his
well within his plan's ca

Finally, he streamed an episode of 'Last Week Tonight' on YouTube.

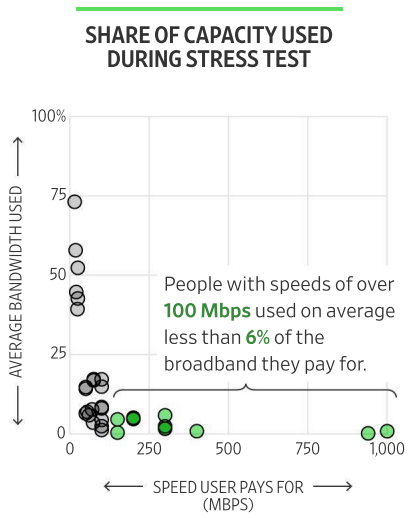
Peter's median usage over 35 viewing minutes was 6.9 Mbps, 5% of the capacity he pays for. For the portion when all seven of his streams were going at once, he averaged 8.1 Mbps.

At one point, for one second, Peter reached 65% of his capacity. Did his video launch faster or play more smoothly? Not really. The researchers said that to the extent there were differences in video quality such as picture resolution or the time it took to launch a show, they were marginal.

"For many people they are not going to see huge differences between 50 Mbps, 100 Mbps and a gigabit per second," said Nick Feamster, a University of Chicago network-performance expert and part of the research team on the Journal project. Some 61% of U.S. households had speeds of 100 Mbps or higher as of December 2018, according to research firm Kagan.

We found similar results across our 34 testers who ran five, six or seven streams at once. The eight users with speeds 100 Mbps or higher who had seven streams going used only about 7.1 Mbps of capacity, on average.

People who paid for even faster speeds still streamed video at about the same speeds as everyone else, resulting in their using a smaller portion of available bandwidth. One person with a 300 Mbps connection streamed at a median of 7.2 Mbps, using 2% of the capacity she pays for.



Shalini Ramachandran, who subscribes to the 15 Mbps tier, used all her bandwidth for a significant portion of the seven-stream test but didn't report any issues with quality.

Mr. Feamster said most households don't use applications that would use up anything close to the bandwidth they pay for. "We had to create an experiment to push the envelope," he said.

There are some cases—such as downloading videogames or other very big files—when full capacity gets used briefly and there would be advantages to having a faster speed, said Guilherme Martins, a researcher on the study. Those situations are rare for most households. In the future, virtual reality and augmented reality may require the superfast speeds providers are selling, Mr. Feamster said.

Mr. Feamster and his research associates have received research funding from companies and institutions including the cable-industry consortium CableLabs, Comcast, tech companies such as Cisco Systems Inc. and Alphabet Inc.'s Google, and the National Science Foundation. No financing was specifically earmarked for the Journal's internet-speeds project.

WHAT DO YOU PAY FOR INTERNET?

WSJ is collecting data on home internet speeds and prices to compare costs across the country. Tell us about your bill.

Representatives for major broadband providers Comcast, Charter, AT&T, Verizon, Altice and Cox said in separate statements that consumers are demanding fast internet speeds to support the many devices in their households, from security cameras to smart appliances, and activities such as ultrahigh definition (4K) streaming, online gaming and telecommuting.

"The demand for speed and capacity will continue to grow rapidly," said Comcast spokeswoman Jennifer Khoury. "Video is only a piece of the speed story."

While the Journal's testing focused on major streaming-video applications, the researchers' software saw how much overall bandwidth households were using. Internet traffic from gaming and other sources like web cameras didn't significantly increase bandwidth usage, the researchers said. Google's cloud-gaming service Stadia recommends users have at least 10 Mbps, while Comcast says 3 Mbps to 6 Mbps is the minimum needed for most online gaming.

The companies also said emerging technologies will require even more bandwidth in coming years. Cox spokesman Todd Smith said the company has a vocal segment of customers "who want to be prepared for the future even if they don't need the speed now and those who want to be the first on the block to have it."

MYTH

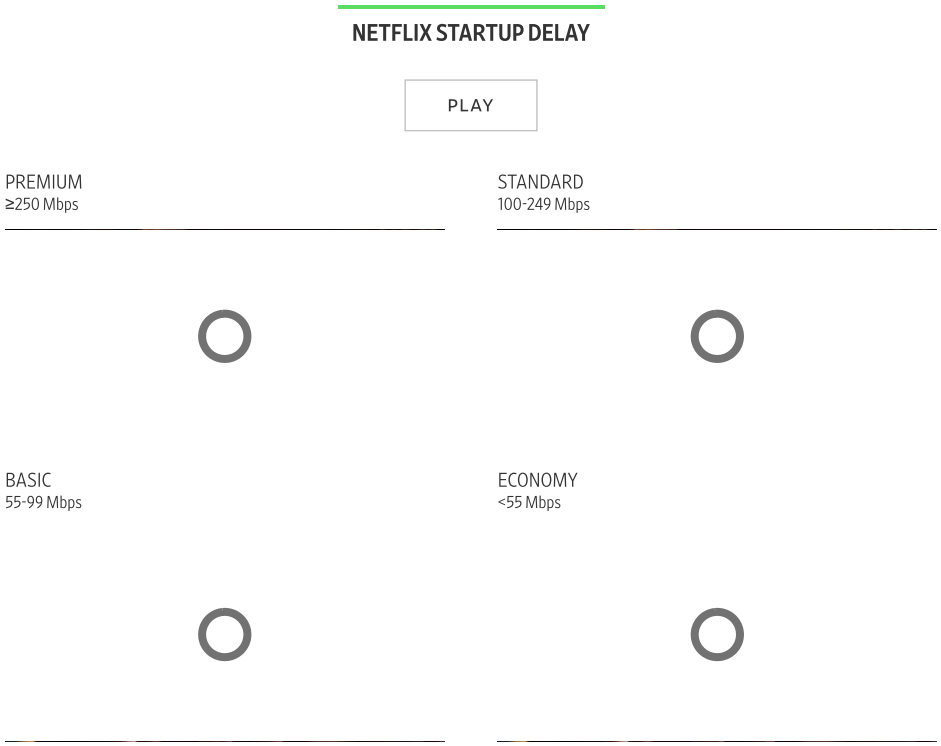
Faster Speeds Allow Videos to Start Quickly

THE TRUTH

Startup Speeds Don't Vary Much

When you press "play" on a streaming service, it responds by quickly sending you a chunk of the video file. Those are the brief spikes you see in the Peter Loftus graphic. People with higher speeds can get higher spikes.

The researchers said the impact of those momentary bursts on "startup delay" is almost imperceptible. Across all users—slowest speed to fastest—the start-time differences for Netflix videos were within one second, on average. The difference in startup delays for Amazon and YouTube was even smaller.



MYTH

HD Streaming Requires Superfast Internet

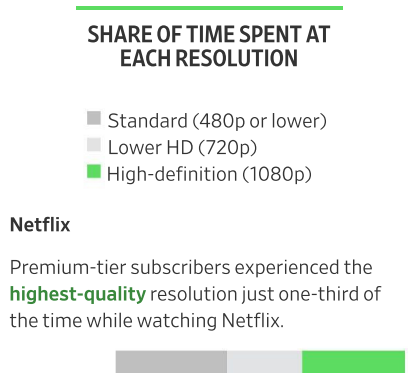
THE TRUTH

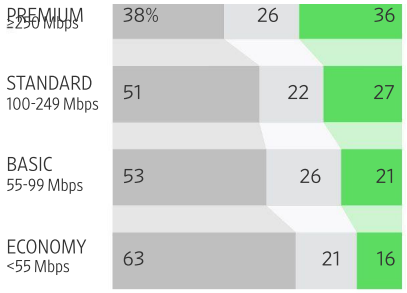
HD Quality Isn't Hugely Impacted by Speeds

Did those spikes in Peter Loftus's test translate into higher picture quality? Barely.

For most modern televisions, the highest picture clarity is the "full" high-definition standard, 1080p, followed by the slightly lower HD standard, 720p, then "standard resolution," 480p. The Journal study found a household's percentage of 1080p viewing had little to do with the speed it was paying for. In some cases, streaming services intentionally transmit in lower resolution to accommodate a device such as a mobile phone.

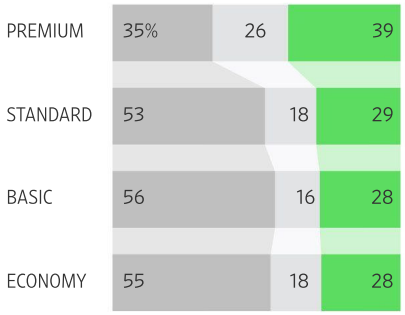
When all HD viewing is considered—1080p and 720p—there were some benefits to paying for the very highest broadband tiers, those 250 Mbps and above.





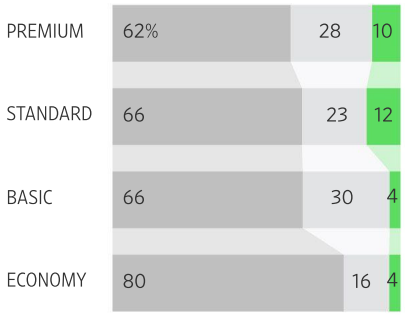
Amazon

On Amazon, all people below the premium tier experienced roughly the same amount of **1080p resolution**.



YouTube

On YouTube, users across the board experienced much less **1080p resolution** than on the other services.



MYTH

Streaming Video Eats Up Lots of Bandwidth

THE TRUTH

Streaming Services Tax Your Connection Lightly

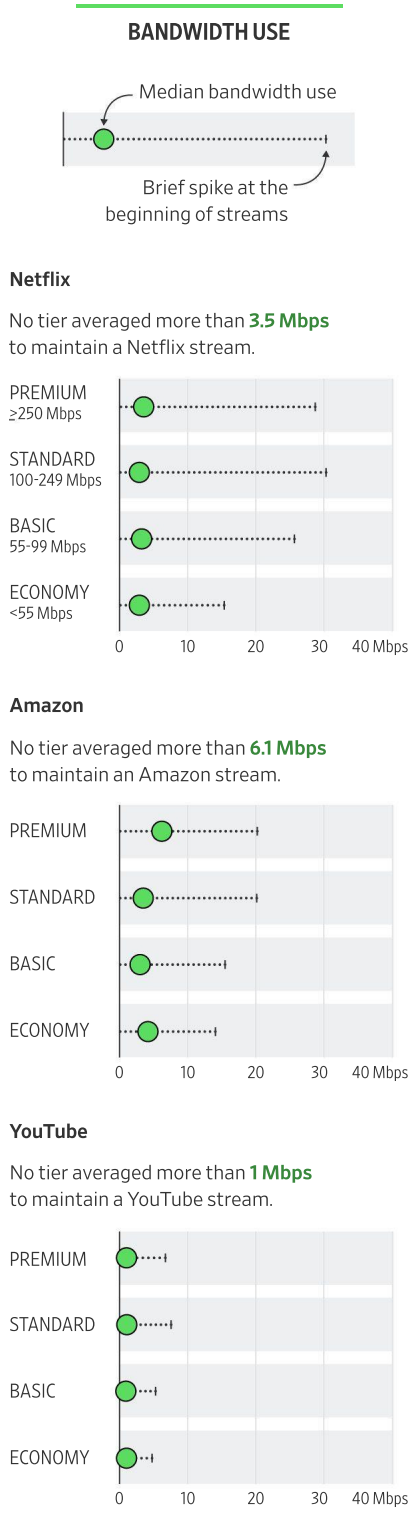
Streaming services compress their streams in smart ways, so they don't require much bandwidth. We took a closer look at specific services by gathering data on our households' viewing over a period of months. Unlike the "stress test," this was regular viewing of shows and movies, one at a time.

Netflix streamed at under 4 Mbps, on average, over the course of a show or movie, with not much difference in the experience of someone who was paying for a 15 Mbps connection and someone with a one gigabit (1,000 Mbps) connection. The findings were similar for the other services.

There is a brief speed spike when a stream begins. Netflix reached the highest max speeds of the services we tested, but even those were a fraction of the available bandwidth.

Users watching YouTube might launch a video slightly faster than those watching Netflix, and at lower resolution, but this is a function of how those services work, not your broadband speed, the researchers said.

Whereas Netflix tries to load "nice high quality video" when you press play and hence has higher spikes, YouTube appears to "want to start as fast as possible," said Paul Schmitt, one of the researchers.



A spokeswoman for Alphabet Inc.'s YouTube said the service chooses playback quality based on factors including type of device, network speed, user preferences and the resolution of the originally uploaded video. A Netflix Inc. spokeswoman said the company aims to deliver quality video with the least possible bandwidth. Amazon.com Inc. had no comment.

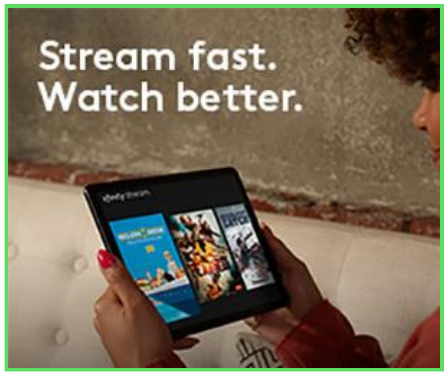
Broadband providers often suggest in their marketing and communications with customers that faster speeds translate into tangible streaming benefits. Cox Communications plays down its 50 Mbps tier in advertisements, saying it is primarily for web surfing and email, whereas 300 Mbps would be optimal for "large file downloads and video streaming."

SAMPLE ADVERTISEMENTS

Internet providers' ads suggest fast speeds improve streaming quality. Below are relevant portions of ads from Altice and Comcast.

ALTICE/OPTIMUM, 2017

COMCAST/XFINITY, 2019



Source: Numberator

Faster tiers generally come at a premium. For example, Comcast's "Blast!" 250 Mbps service costs $94.95 a month in Jersey City, N.J., compared with $49.95 a month for a 15 Mbps connection.

So what is happening when you encounter a spinning wheel as Netflix attempts to load? In most cases, said the researchers, it has nothing to do with the broadband speed. Upgrading to a higher speed tier often isn't the answer.

Related video: More Bandwidth Might Not Speed Up Your Internet. Here's Why.

There are a number of factors that could impact users' experiences. A streaming video can pass through multiple internet middlemen—even across different states—before it gets to your broadband provider. Then it goes through your router, often over Wi-Fi, to various devices throughout your home. Those are opportunities for bottlenecks or hiccups.

Broadband-industry experts said when consumers complain about service, the most cost-efficient action for call-center representatives is offering a faster package, even if that doesn't solve the problem.

That "makes the tech support call shorter," Mr. Feamster said, "and it helps the internet service provider sell faster service."

Jessica Kuronen, Lillian Rizzo and Andrew Levinson contributed to this article.

Methodology: The Wall Street Journal and researchers at the University of Chicago and Princeton University devised an experiment to measure the internet speeds users experience while using popular streaming-video services.

The Journal recruited 53 of its journalists to participate. They were scattered in cities across the country, with a substantial number in the New York area and others in Houston, San Francisco, Washington, D.C., Miami, Chicago, Los Angeles and elsewhere. They were signed up to a range of major broadband providers and included a mix of families, couples and those living alone.

Each participating household was given a high-performance TP Link Wi-Fi router. It was hooked up to a small computer that was preloaded with software developed by the researchers to capture usage data.

The experiment was carried out over several months in 2018 and early 2019. In our "passive" testing, users were asked to stream shows and movies as they normally would, using services including Netflix, YouTube, Amazon Prime Video, Facebook, Sling TV, AT&T TV Now, Hulu, HBO Now and more.

The researchers' software was designed to measure the bandwidth households were consuming (or the speeds they were experiencing) for various applications. Detecting the specific services being used was complex; the research team and the Journal prioritized detecting streaming video over other applications.

The median time it took to begin streams, or "startup delay," and resolution, or picture quality, were estimates based on predictive models created by the research team. The models were tested against a "ground truth" established in the lab.

In our "active" testing, users conducted a "stress test," streaming several services simultaneously on multiple devices.

Panelists consented to their usage being monitored. The researchers' software didn't collect information on the specific content people were watching.