

Chapter 4

BROADBAND INTERNET: FCC SHOULD TRACK THE APPLICATION OF FIXED INTERNET USAGE-BASED PRICING AND HELP IMPROVE CONSUMER EDUCATION*

United States Government Accountability Office

WHY GAO DID THIS STUDY

Access to broadband Internet is seen as being crucial to improving access to information, quality of life, and economic growth. In recent years, some Internet providers have moved away from unlimited data plans to UBP with uncertain effects on consumers.

GAO was asked to review the use of UBP by Internet providers. This report examines: (1) information available about the application of UBP by Internet service providers; (2) issues related to UBP selected consumers report are important to them; and (3) the potential effects of UBP on consumers.

GAO collected data on Internet plans from the country's 13 top fixed and 4 top mobile providers; contracted with a market research firm to assist with conducting eight focus groups held with consumers in four cities selected to reflect geographic diversity; reviewed relevant studies; and interviewed

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officials from the top Internet providers, FCC and industry stakeholders, including researchers, policy, and industry organizations.

WHAT GAO RECOMMENDS

GAO recommends FCC: (1) work with fixed providers to develop a voluntary code of conduct to improve consumer communication and (2) make use of existing data to track fixed Internet UBP and its effects on consumers nationwide. FCC said it will monitor complaints and provider plans to determine if a more proactive approach is needed. GAO continues to believe that better communication is warranted. FCC agreed to use existing data to analyze UBP issues.

WHAT GAO FOUND

Based on an analysis of consumer data plans of the top 13 fixed—in home—and 4 mobile Internet providers, GAO found that mobile providers employ usage-based pricing (UBP) more commonly than fixed. Under UBP, providers can charge varying prices, change connection speeds, or take other actions based on Internet data consumed. The 4 largest mobile providers in the country all use UBP to some extent; 7 of the 13 largest fixed providers now use UBP to some extent. Because prices can vary based on usage, it may be important that consumers be informed about data. GAO found that some tools offered by fixed providers to educate consumers regarding data can be confusing. For example, some provider estimates vary on data consumed for the same type of content. While mobile providers follow a voluntary code of conduct, developed with the Federal Communications Commission (FCC), to encourage useful, consistent consumer education, no similar code exists among fixed providers potentially resulting in confusion and a lack of consumer awareness regarding data needs.

Participants in all eight of GAO's focus groups reported being subject to mobile UBP and expressed some concerns about it, such as difficulty tracking data usage among many devices. Yet participants accepted mobile UBP and adapted by, for example, limiting use of high-data content and by connecting to Wi-Fi. By contrast, only a few participants in three focus groups reported being subject to fixed Internet UBP. Participants expressed concerns about

possible increases in prices for access caused by fixed-Internet UBP and the potential effect of limits on their fixed Internet, where they have not considered data usage. Participants exhibited confusion over data consumption—for example thinking that low-data activities like online shopping consumed large amounts of data. Participants also expressed concern about difficulty tracking the wide range of devices accessing their fixed data allowance and that fixed UBP may negatively affect students, people working from home, and those with lower socio-economic status.

The potential effects of UBP are uncertain and could depend on competition among providers. Based on economics literature, UBP can address the usage of the heaviest data users and can benefit consumers by providing more options as opposed to a one-size-fits-all unlimited data plan. The literature also suggests that providers could implement UBP to benefit consumers—for example, by offering low-data, low-cost plans for those who do not want an unlimited data plan. While mobile providers GAO reviewed offer such plans, fixed providers—generally facing less competition—do so to a lesser extent. According to the literature, providers facing limited competition could use UBP to increase profits, potentially resulting in negative effects, including increased prices, reductions in content accessed, and increased threats to network security. Several researchers and stakeholders GAO interviewed said that UBP could reduce innovation for applications and content if consumers ration their data. While FCC is collecting data regarding fixed UBP, it is not using this data to track UBP use because it only recently started collecting the data specifically to analyze prices. As a result, although FCC is charged with promoting the public interest, it may not know if UBP is being used in a way that is contrary to the public interest and, if so, take appropriate actions.

ABBREVIATIONS LIST

ACSI	American Customer Satisfaction Index
FC	Federal Communications Commission
GB	gigabytes
MB	megabytes
UBP	usage-based pricing

November 24, 2014

The Honorable Anna G. Eshoo
Ranking Member
Subcommittee on Communications and Technology
Committee on Energy and Commerce
House of Representatives

Dear Ms. Eshoo:

Access to affordable broadband Internet is increasingly seen as being crucial to improving access to information, quality of life, and commerce and as a driver for economic growth and innovation. Broadband allows people to share large amounts of information at increasingly faster speeds and provide access to information otherwise unavailable.¹ For example, access to broadband allows individuals to take advantage of educational opportunities online that are otherwise unavailable in their local area. According to the Federal Communications Commission (FCC), the number of mobile and fixed (or in-home) broadband connections in the United States grew from 45.6 million in June 2010 to 163.7 million in June 2013.² The amount of data accessed over the Internet has also grown significantly in recent years and is expected to continue to grow significantly. For example, Cisco (a provider of network infrastructure) projects that consumer Internet traffic in North America will grow at an average annual rate of 21.5 percent between 2013 and 2018.³

In recent years, some mobile and fixed Internet service providers (providers) have begun using a practice known as usage-based pricing (UBP).⁴ This involves the provider changing the price to customers, or otherwise adjusting their service, based on the volume of data they use. Such pricing strategies can take multiple forms, including offering specific levels of data usage to customers, also known as data allowances. Consumers who exceed their data allowance could face additional charges or reduced connection speeds. Given the growing importance of Internet access as well as growing data usage, it is important to understand how the use of UBP, as opposed to unlimited data access, may affect Internet consumers.

You asked us to review the use of usage-based pricing by mobile and fixed broadband-Internet providers. This report examines: (1) what information is available about the application of usage-based pricing by Internet service providers; (2) issues related to usage-based pricing that

selected consumers report are important to them; and (3) the potential effects of usage-based pricing on consumers.

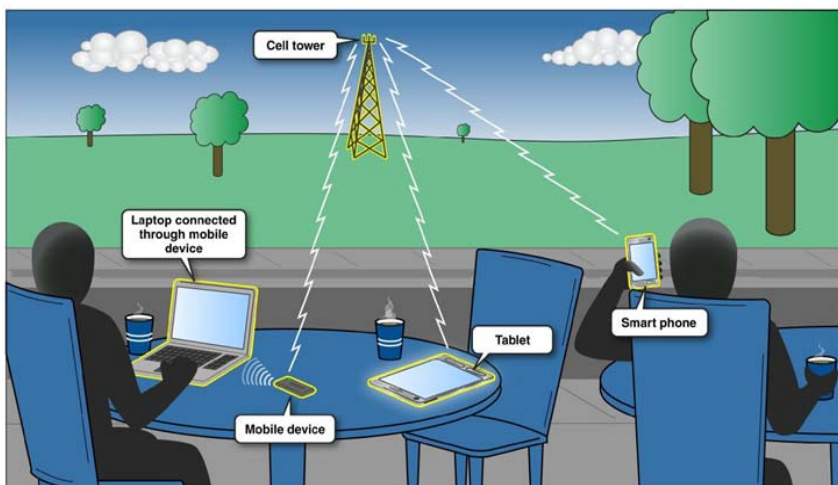
To review what information is available on the application of UBP by Internet providers, we collected data on current Internet plans⁵ from the top 4 mobile and 13 fixed providers⁶ (to account for 98 percent of each market).⁷ We analyzed these data to determine use of UBP and UBP plan details. We collected plan information on providers' public websites and validated it with each provider. Plan details—including any data allowances—were valid as of October 2014, but could change at any time. Because we obtained data online and confirmed the accuracy of the data with the providers, we determined that these data were sufficiently reliable for the purposes of our report. To determine issues related to UBP that selected consumers report are important to them, we conducted eight focus groups with Internet consumers (two each in: Baltimore, Maryland; Des Moines, Iowa; Las Vegas, Nevada; and New York, New York) to gather information on consumers' experiences with and opinions of UBP. The cities were selected to ensure diversity in geographic location and population of metropolitan areas. We contracted with a market research firm to recruit and screen participants and assist in holding the focus groups. Participant characteristics included a mix of education levels, races, genders, and income levels. Each group had 9 to 10 participants for a total of 77. Given the nature of the focus groups, findings from the groups represented the views of participants and are not generalizable to all Internet consumers; however, we believe that the focus groups provided valuable insight into issues related to UBP that are important to consumers. To review the potential effects of UBP on consumers, we conducted a search and review of relevant literature and studies and interviewed officials from the Internet providers mentioned earlier. We also interviewed FCC officials as well as industry stakeholders, including academics and researchers, public interest groups, industry associations, and others based on the literature search and recommendations of other stakeholders. (For more information on our scope and methodology, see app. I.)

We conducted this performance audit from November 2013 through November 2014, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

BACKGROUND

Consumers generally subscribe to broadband Internet in two ways:

- **Mobile:** Traditionally, mobile providers sold access to the Internet as an add-on to mobile telephone service plans that may or may not include a multiyear contract. Mobile service is provided through cell tower coverage with data sharing through radio spectrum.⁸ Because of a number of factors, including the number of users sharing certain parts of the network and the amount of data transmitted, mobile networks can experience congestion, or a slowdown in connection speeds. Subscribers can connect a variety of devices directly to mobile networks (see fig. 1).⁹

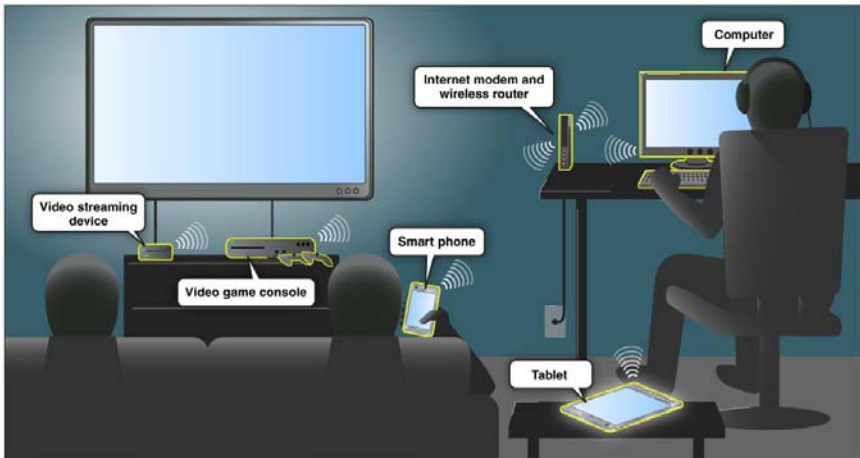


Source: GAO. | GAO-15-108.

Figure 1. Examples of Devices Connected to Mobile Internet Network.

- **Fixed:** In-home fixed Internet plans are often sold as a monthly subscription by cable television or telephone companies. Service from cable television companies is generally provided through the same coaxial cables that deliver television programming. Service from telephone companies is generally provided through the telephone lines (digital subscriber line service) that provide telephone voice services or fiber-optic lines which convert electrical signals carrying data into

light and send the light through glass fibers. These network technologies generally have higher data transfer rates than mobile networks. Consumers can connect a variety of devices to in-home fixed networks through a wired connection or wireless Wi-Fi¹⁰ connection (see fig. 2). Consumers are increasingly using the Internet to supplement or replace their use of traditional services, such as traditional telephone and cable TV service.



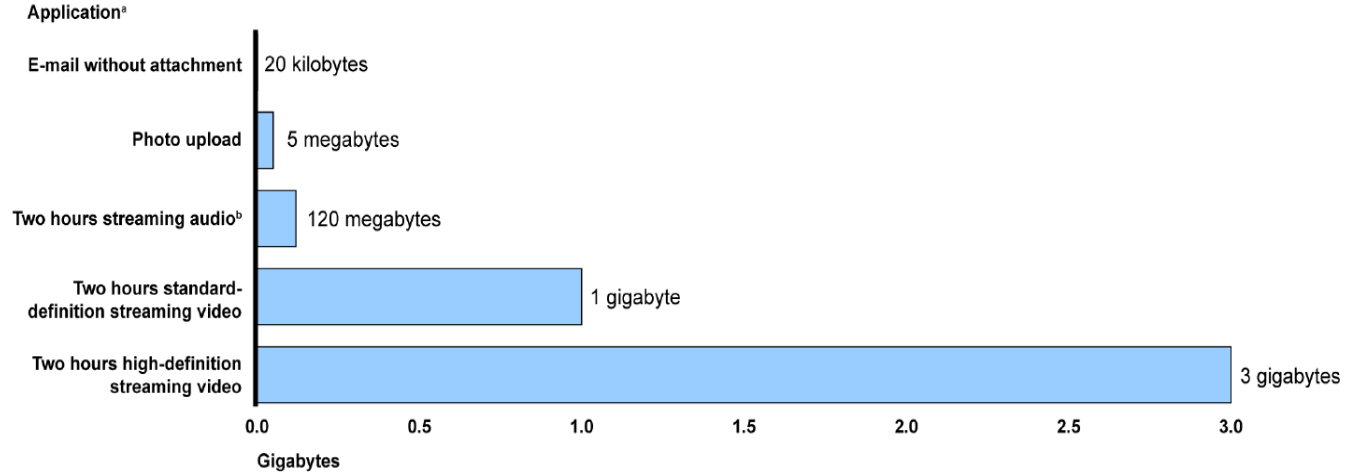
Source: GAO. | GAO-15-108.

Figure 2. Examples of Devices Connected to In-Home Fixed Internet Network.

Different types of Internet applications use varying amounts of data. Figure 3 below shows selected examples of how much data certain applications use, as reported by fixed Internet providers on their websites. Internet applications that use small amounts of data can include e-mail.

Applications that can use large amounts of data include streaming video—more than a gigabyte per use of the application.

Mobile and fixed Internet data use is likely to grow significantly in the future. Cisco projects consumer fixed data usage to grow at an annual rate of 21.5 percent from 2013 to 2018.¹¹ Cisco also projects that mobile data usage in North America will grow at an average of 50 percent annually from 2013 to 2018 while Ericsson—a provider of network infrastructure—projects North American mobile data growth of 38 percent per year between 2013 and 2019.¹²



Source: GAO analysis of wireline provider websites. | GAO-15-108.


^aEstimates can vary by each provider.

^bTwo hours streaming audio is based on an estimate of 4 megabytes per song and 15 songs per hour.

Figure 3. Examples of Data Usage by Selected Common Internet Applications.

This trend is due to multiple factors including increased adoption of smartphones and tablets, growth in streaming video, innovation in services and applications, growth in subscriber numbers, and the development of faster networks. Although Internet providers have expanded their networks' capacity, the potential for in-network congestion that could slow the transfer of data has increased due to a number of factors including the increase in streaming video and multiple broadband devices.¹³

Usage-based pricing (UBP) is the practice of pricing or otherwise adjusting service, such as connection speed, based on the volume of data transmitted. According to FCC's Open Internet Advisory Committee, UBP by Internet providers can be used through data allowances (sometimes referred to as "caps") in which a subscriber obtains a defined amount of data per month.¹⁴ Subscribers who exceed their allowance could face a number of actions including additional charges for additional data or a reduction in connection speeds—known as "throttling."



Under the Communications Act of 1934, as amended by the Telecommunications Act of 1996, FCC has statutory authority to regulate telecommunications for the purpose of making available rapid and efficient communications at reasonable charges¹⁵ and fostering competition.¹⁶ Under the Telecommunications Act of 1996, FCC, in order to eliminate market barriers, was to promote policies favoring vigorous economic competition and the public interest in the provision of telecommunications services.¹⁷ One of FCC's goals is to foster competition and maximize consumer benefits of broadband access.¹⁸ It seeks to accomplish that goal by collecting data, monitoring broadband availability, and establishing rules for transparency in internet service, among other things.

MOBILE PROVIDERS EMPLOY USAGE-BASED PRICING MORE WIDELY THAN FIXED PROVIDERS AND AGREE TO A CODE OF CONDUCT

UBP More Commonly Used by Mobile Than Fixed Providers

- **Mobile:** Based on our analysis of data plans, all four mobile providers we reviewed now offer some form of UBP Internet plans. Of these four providers:

- Two offer data allowances ranging from a low of 250 or 300 megabytes (MB) to a high of 100 gigabytes (GB) a month whereby larger allowances cost more overall (though less on a per MB or GB basis) and customers can share one data allowance among multiple devices.¹⁹ They impose overage charges (which can range from \$20 for 300 MB on small data plans to \$10 or \$15 for 1 GB of additional data on larger data plans) for customers who exceed their allowance.
- One offers a variety of data plan options, all of which feature unlimited data. Customers can select unlimited high-speed data or high-speed data allowances ranging from 1 GB to 21 GB. Once customers reach their high-speed data allowance, they may continue to access unlimited data, but at slower connection speeds of 128 kilobits per second or less, slower than speeds FCC recommends for browsing the web or downloading e-mail.
- One offers unlimited data plans but also usage-based plans with allowances ranging from 1 GB to 120 GB per device. Customers who exceed their data allowance are subject to overage charges of 1.5 cents per MB.
- All four offer their data plans equally across their entire customer base in all markets they serve.
- **Fixed:** Based on our analysis of data plans, seven of the 13 fixed Internet providers we reviewed are now offering, to some extent, Internet plans that include elements of UBP. Of these seven providers:
 - Three use data allowances (ranging from 150 GB to 4,000 GB) where higher allowances are generally tied to faster connection speeds and higher overall prices (though less on a per GB basis). They impose fees on customers who exceed their allowance (generally starting at \$10 for an extra 50 GB).
 - Two have data allowances, but do not impose fees or normally take other action when customers exceed their data allowance.²⁰
 - One offers a low-data allowance option (5 GB or 30 GB per month²¹) at a discounted rate (\$8 or \$5 off a month respectively) off the normal prices for some of its unlimited data plans. Customers who exceed their data allowance are assessed overage fees of \$1 per GB over the limit, with a maximum charge of \$25 per month.
 - One is testing multiple UBP approaches in 14 select markets of varying sizes around the country. This provider is testing plans

including those with allowances and overage fees. Allowances are generally 300 GB regardless of the plan's connection speeds (in one market allowances can increase to 600 GB, depending on plan speed) and overages are generally \$10 for 50 GB of additional data. In some of these markets, this provider offers a low-data plan at a discount (a \$5 discount off the regular price for unlimited data for a 5 GB data allowance with overage charges of \$1 per GB).

- Aside from the provider that is testing UBP in selected markets, all providers that use UBP do so in all markets they serve across their entire customer base or plan do to so in the future.²²

Mobile and Fixed Providers Moving Away from Unlimited Data to UBP Plans

Both mobile and fixed Internet providers have increasingly been moving from unlimited data plans to usage-based plans.

- **Mobile:** Two mobile providers, which together have over 68 percent of the mobile market, first introduced UBP in 2010 and 2011 and no longer offer unlimited data plans.²³ Another provider still offers unlimited data but, according to officials we interviewed, first introduced UBP plans in 2013 to provide greater choice to consumers and to compete with other mobile provider plans. Since first introducing UBP-based plans, all four providers have increased both the variety of data plans and the levels of data allowances in these plans. For example, one provider recently offered a promotion that doubled data allowances for selected data plans without increasing prices.
- **Fixed:** Most fixed Internet providers that have UBP introduced their current data plans in the past 4 years. However, unlike mobile providers, not all fixed providers that use UBP have increased their data allowances on existing plans since 2012. Some higher speed, higher priced plans introduced since 2012, however, have come with higher data allowances than previously existing plans.

The number of providers that utilize UBP and, therefore, the number of Internet customers that are affected by it, could grow in the future. While providers we interviewed that do not use UBP said they have no plans to introduce such plans in the future, they added that they will continue to track the market and would not rule out using UBP.

Tools to Help Understand Internet Data Use Have Limitations

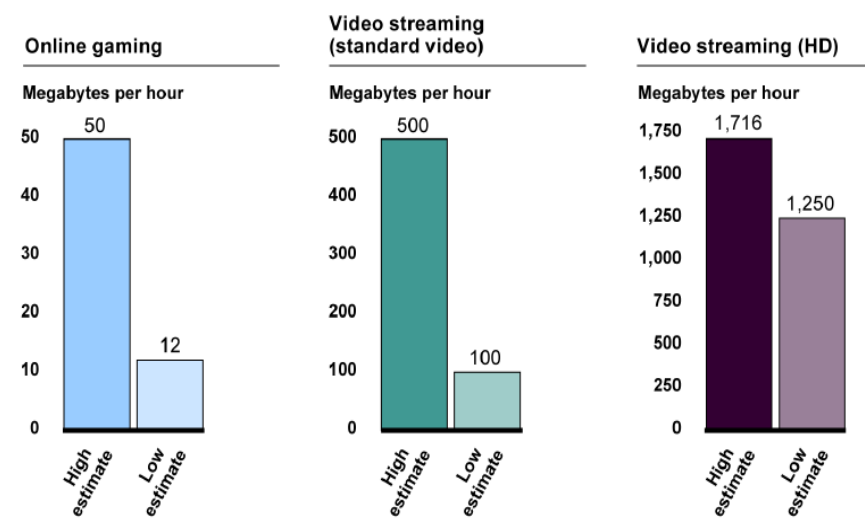
Given that, under UBP, the price consumers pay for Internet access can depend on how much data they use, it may be important for consumers to have a thorough understanding of their data needs and usage. Under unlimited data plans, consumers do not need to necessarily be aware of their data usage as the price they pay for service is unrelated to their data usage. But under UBP, for example, if consumers do not understand their data usage, they may choose plans that include allowances that are too large—and cost more—than needed. Alternatively, they may purchase too little data and potentially face overage charges.²⁴ Furthermore, “hidden” data uses—such as automatic updates and applications that push content to devices that consumers are unaware of—could represent as much as 30 percent of data use, meaning consumers could use large amounts of data without their knowledge.²⁵

Both mobile and fixed providers that use UBP offer a variety of tools to their customers to help them understand, and estimate, their data usage; however, fixed providers do so to a lesser extent. Tools that providers offer to customers include:

- tools to estimate data usage based on the consumer’s estimate of their usage, including monthly e-mails, web pages, and videos;
- discussions with customer service representatives on the appropriate data plan, given their estimated or prior usage;
- web-based tools and details on customer bills regarding actual current and historic usage; and
- alerts—such as through email or texts—when approaching or exceeding data allowances.

However, some of these efforts may have limited value for fixed Internet consumers due to a number of potential weaknesses. First, different providers may provide varying estimates of data usage for similar applications, as shown in figure 4. While these differences may be due to different technologies

providers use, varying estimates could be confusing to consumers. Second, provider estimates of data usage of certain applications, and the large variation in such estimates such as streaming video as seen below, could be a factor in consumers’ decisions regarding what data plan to subscribe to. Estimates provided by providers can differ from one customer support document to another; we found one provider that estimated 4 GB of data usage for a 1-hour movie in one document available to consumers, but in another document estimated only 1.5 GB. As discussed later in this report, participants in our focus groups expressed confusion regarding their data usage, including the amount of data that certain types of applications use. Third, data usage meters—which are used by providers to measure how much data their customers use—may be inaccurate. An official with a company that conducts internal audits of fixed-Internet-provider data meters and their integration into databases used for billing systems told us that while some of their audits have shown that meters are accurate, others have shown the need for improvements that those providers are in the process of making.



Source: GAO analysis of wireline provider websites. | GAO-15-108.

Figure 4. Examples of Variances in Estimates of Application Data Usage among Fixed Providers.

Mobile Provider Communications to Consumers Guided by a Code of Conduct Absent among Fixed Providers

All four mobile providers we reviewed agreed to the voluntary Consumer Code for Wireless Service, which aims to help consumers make informed choices when selecting and managing their mobile services. This code, developed as a joint effort between FCC and CTIA—a group representing the mobile communications industry whose members cover the majority of mobile subscribers—gives providers guidelines for notifying consumers about data use through means such as text alerts, encouraging them to provide useful and consistent information to consumers.²⁶ As mentioned earlier, one goal of FCC is to protect the public interest in the provision of telecommunications services. According to FCC officials, following the implementation of this code by providers, complaints to FCC by mobile customers regarding overage charges on bills dropped.

Although fixed providers make certain consumer education efforts regarding data use—such as providing alerts—there has not been a formal effort facilitated by FCC like with the Consumer Code for Wireless Service. According to FCC officials, FCC has focused its effort so far on mobile Internet as more mobile consumers are affected by usage-based pricing at this time. According to FCC officials, the volume of consumer complaints filed with FCC regarding fixed-Internet UBP is relatively low when compared with the overall number of complaints concerning broadband service. However, the low number of complaints does not necessarily mean that consumers are satisfied with the information provided by their fixed providers. We have previously found that consumers may not know that they can file complaints with FCC.²⁷ As a result of the lack of a fixed provider code of conduct, information provided to consumers is not always consistent or easy to understand. This could result in a lack of consumer education regarding data, a lack that, as mentioned earlier, could lead to consumers not purchasing their ideal data plan.

Under the Open Internet Transparency Rule,²⁸ providers must be open and transparent about the terms and conditions of their Internet plans. FCC issued an FCC Enforcement Advisory to Internet providers in July 2014²⁹ summarizing the general requirements of this rule. However, the advisory did not provide details regarding specific information that providers must disclose and at what level of detail.³⁰

Furthermore, fixed providers have received low levels of satisfaction in customer surveys. The American Customer Satisfaction Index (ACSI) notes that as the number of Internet users has grown and exceeded the number of households that have landline service, customer satisfaction with fixed providers has decreased.³¹ Concerns about Internet data aspects may also be reflected in consumers' rating Internet providers the lowest among 43 household consumer industries in the ACSI. In particular, consumers report low levels of satisfaction with "ease of understanding their bill" and "variety of plans."³²

INTERNET CONSUMERS IN FOCUS GROUPS ACCEPTED MOBILE USAGE-BASED PRICING, BUT HAD CONCERNS OVER FIXED

Focus Group Participants Said They Are Not Used to Thinking about Fixed Data Usage and Exhibited Confusion over Data Usage

A common sentiment expressed by focus group participants was that they had no idea how much data they use at home—likely in large part because they have never been subject to data allowances and, therefore, have not needed to consider their data usage at home. One participant, for example, said, "It's unlimited... so we don't really pay attention." In all eight groups, participants said that they frequently connect their mobile devices to their in-home Wi-Fi without considering the amount of data these devices use on their in-home network. In seven of the eight groups we heard from, participants who said that they would face challenges in tracking the data usage of the multiple people and the multiple devices in their household. For example, having to tell other family members, such as children, to reduce their data usage was cited as a challenge.

In addition, focus group participants exhibited many instances of confusion and a lack of understanding of their fixed-Internet data usage. For example, some participants were concerned that fixed Internet UBP might require them to limit data-light activities such as online shopping in order to avoid exceeding their data allowance when in reality any normal level of those activities would not likely result in a user nearing even a low data allowance.³³ Others classified themselves as heavy data users during our initial screening

process, despite the fact that during group discussions they said that they primarily use low-data applications such as online shopping. Therefore, those participants could potentially benefit from a lower-priced low-data plan as opposed to an unlimited data plan.

Consumer surveys and studies also indicate that Internet users are not clear about the details of their Internet plans and data use. FCC reported in 2010 that 80 percent of broadband users did not know their home connection speed.³⁴ A June 2013 Canadian Consumer Union study on mobile consumer data use concluded that the majority of respondents did not know and were not able to easily calculate their data usage, and more than a third of respondents did not know how quickly their usage limits can be reached.³⁵

Focus Group Participants Generally Expressed Few Concerns Related to Mobile UBP

Although participants in our focus groups were widely subject to UBP for their mobile Internet, when asked what factors were important when considering a mobile data plan, participants expressed a preference for unlimited mobile data access in seven of our eight focus groups. Across all eight focus groups, we found a mixture of participants who reported having mobile Internet service that included data allowances and those who identified their mobile data plan as having unlimited data. In three of the eight groups, we found participants who have held onto “grandfathered” unlimited plans by not upgrading their devices, potentially trading the loss of improved technology—both newer devices and faster networks that older devices may not be able to access³⁶—for unlimited data.

Focus group participants expressed few broad concerns about mobile UBP; more focused concerns included avoiding overage fees and managing data plans shared by more than one person. For example, some participants discussed the difficulty of monitoring or controlling the data usage of family members—such as a child—with a device on a shared data account given the potential for data overages.

Participants demonstrated that they have learned to adjust to mobile data allowances and throttling. They discussed the following strategies for limiting the amount of mobile data they use and otherwise adapting to mobile UBP, including:

- limiting use of data-heavy applications such as video;
- connecting devices to Wi-Fi at home and other places to avoid mobile data usage; and
- changing to data plans or providers that better meet their needs. (For example, we spoke with participants who reported having changed their data plans to increase their data allowance while others, after realizing that they subscribed to a data plan that had more data than needed, have changed their plans to reduce their data allowance as well as their price for service.)

Participants also said that they were aware of the tools that their mobile provider offers them, including online tools to estimate data usage and text alerts when they near their data allowance. In all eight groups we found participants who track their data use through tools from their provider, such as online data meters and information on their bills, and in seven groups, found participants who experienced receiving alerts when their usage approached their data allowance.

Participants noted that such tools were helpful in choosing a plan or avoiding overage charges.

Focus Group Participants Were More Concerned about Fixed UBP

The more limited use of UBP by fixed providers was evident in our focus groups. In three of the eight groups, participants reported experience with fixed Internet UBP and in seven groups there were participants who said they were unaware that some fixed providers have implemented such plans.

While we found that some participants in each group voiced positive reactions to the concept of fixed Internet UBP, there was more discussion regarding negative reactions and concerns. In expressing positive reactions toward the concept of fixed Internet UBP, participants noted the potential benefit of more pricing options. Other reactions included liking the idea of paying less money for less data or stating that it was fairer to pay only for data used.

Others noted that they should pay less for their access than people who use a lot of Internet data. However, participants in all eight groups expressed strong negative reactions to the concept of fixed Internet UBP, and these

discussions overshadowed discussions about the potential benefits of UBP. Common issues discussed at our groups included:

- Concern of the potential effects of data allowances given the importance of the Internet in their lives. Participants cited the importance of the Internet for commerce, education, and employment and expressed concern that UBP could limit their access to the Internet.
- Concern that providers would use UBP as a way of increasing the amount they charge everyone for Internet service, in part because in their view consumers—having become accustomed to unlimited data and reliant on Internet access—would have no choice but to pay more. Some were skeptical that UBP would be used to reduce prices for any customers.
- Fixed internet UBP negatively affecting certain populations, such as students and telecommuters who may use a lot of data at home and those with lower-socio-economic status who may have difficulty affording data plans with sufficient data allowance. In addition, in all eight groups there were participants who said they watch streaming video as a substitute for television, a group of consumers who may be more likely than others to be affected by UBP.
- Having to worry about monitoring and potentially limiting data usage at home if subject to UBP, given that participants were used to the freedom of unlimited home access. In six groups, at least one participant said that they would accept UBP if it was only used by providers to offer discounts on lower-data plans while unlimited data plans remained the standard.

While, as discussed earlier, participants have found ways to adapt to mobile UBP, such adoption may not be so easy for fixed access. For example, fixed Internet consumers may be less willing to reduce their use of streaming video or other data-heavy applications at home. And while participants said they connect their mobile devices to Wi-Fi, there is no similar option for avoiding in-home data usage; while we heard some comments where participants said they might leave their house to use the Internet—for example to connect to free Wi-Fi at coffee shops—that may not be possible for all in-home data uses such as teleworking and education.

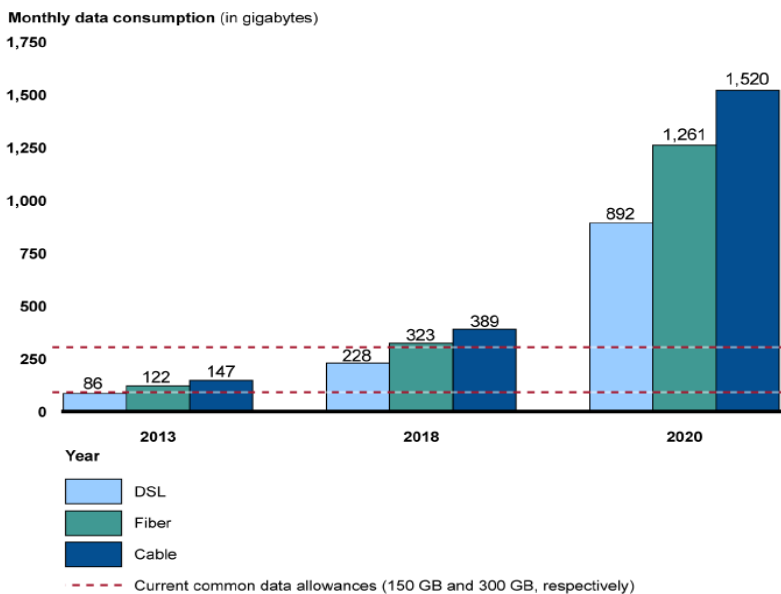
THE POTENTIAL EFFECTS OF USAGE-BASED PRICING ON CONSUMERS ARE UNCLEAR AND COULD DEPEND ON COMPETITION

Usage-Based Pricing Could Increase Costs on Heaviest Users, but May Not Be Warranted

One economic rationale for UBP is to address situations where users take into account their own costs and benefits from Internet access, but ignore other costs—such as congestion—that they impose on other users—referred to as “externalities.” In the presence of such externalities, economists often propose that consumers should be charged prices that reflect both of these types of costs in order to ensure that the consumers use the resource efficiently. All four mobile providers told us they use UBP to address the usage of heaviest users, manage their networks, or address congestion. All but one fixed providers we reviewed that enforce UBP said that they use UBP to address the usage of the heaviest data users. Most fixed providers said that their networks do not face widespread congestion. Most fixed providers we interviewed that use UBP said that they have set their allowances so that they currently affect only at most the three to five percent of users that use the most data, not average users. In addition, two fixed providers we interviewed told us that they are continually upgrading and expanding their networks to meet demand and UBP can be used to ensure that heavier users contribute more to those costs than lighter users.

However, some industry stakeholders we interviewed said that UBP may not be warranted to address the data usage of the heaviest users. Two public interest organizations claimed that because the marginal costs of data delivery are very low and falling, heavier users impose few additional costs to providers than lighter users do. According to FCC, however, prices set on marginal costs would generally not allow providers to recover their costs. In addition, according to one paper we reviewed, absent network congestion, one person’s use of the Internet does not interfere with other users, meaning that there is not a need to limit activity.³⁷ Officials with those organizations added that more targeted UBP approaches, such as peak pricing during congested times, could address predictable congestion when it exists and place less burden on consumers overall. However, according to FCC, there are problems with peak pricing as it may not be an efficient means, or even allow, for ISPs to recover their costs of providing Internet access. Finally, to the extent that

fixed Internet UBP is used to address the usage of the heaviest users, the number of customers affected could grow over time. According to Sandvine—a provider of networking solutions—fixed Internet customers who appear to use the Internet to replace traditional subscription-television service already use an average of 212 GB a month³⁸, close to many existing data allowances.³⁹ Furthermore, according to FCC, the top 15 percent of cable Internet subscribers use over 145 GB of data a month and fiber-optic Internet subscribers use over 120 GB per month.⁴⁰ Based on Cisco’s estimate of data growth, noted previously, of 21.5 percent per year for fixed Internet data, their data usage could reach more than double common current data allowances of 150 or 300 GB by 2020 (see fig. 5). In addition, more users could be affected by UBP in the future to the extent that average users begin using more data-heavy applications and content providers continue to develop more data-intensive content and applications.



Source: GAO analysis of FCC and Cisco data. | GAO-15-108.

Note: Cable is service from cable television companies which is generally provided through the same cables that deliver television programming. DSL is provided from telephone companies through the lines that provide telephone voice service. Fiber is provided on fiber-optic lines.

Figure 5. Estimated Monthly Data Usage (Gigabytes) of Top 15 percent of internet users, 2013, 2018, and 2020.

UBP Can Be Used to Provide More Options to Consumers, but Benefits Unclear When Competition is Limited

A second rationale for UBP is that it has the potential to increase consumer welfare. According to economics literature, UBP can be interpreted as a form of price discrimination, where sellers offer the same or similar goods at different prices and consumers choose among these versions. In a competitive market place, this practice may enhance consumer welfare because firms may compete to offer different versions of a product at competitively low prices. As a result, in a competitive marketplace, providers could use UBP to innovate on the types of plans they offer. For example, this scenario could allow low-data users to buy plans with low data allowances at competitively lower prices, and heavier data users could buy plans with higher data allowances that best meet their needs. In contrast, in markets that are not very competitive, this kind of price discrimination may not be beneficial because limited competition gives the seller greater ability to make take-it-or-leave-it offers to consumers—who may face few choices to move to other providers—that may enhance providers' profits at the expense of consumer welfare. FCC officials said that they believe economics literature is inconclusive on these matters.

There is generally more competition among mobile providers than among fixed providers. According to FCC, 54 percent of households are in census tracts that have more than two fixed providers with subscribers to services with a download speed of at least 6 Mb/second and upload speed of at least 1.5 Mb/s.⁴¹ By contrast, according to FCC, almost 98 percent of the U.S. population lives in census blocks with more than two mobile providers.⁴² Participants in six of our eight focus groups said they would look to switch providers if faced with fixed Internet UBP, but participants in all eight groups said that they faced limited choice in providers, which may limit their ability to select a data plan that best meets their needs.

All mobile providers and two fixed providers we interviewed told us that they in part use UBP to offer more Internet plan options to meet individual needs; as a result, providers don't require all consumers to pay for unlimited data or high-speed data at a fixed price. Consequently, consumers who want to use low amounts of data can pay less than those who use more. For example, one mobile provider offers a 1 GB data plan for \$40 a month compared to \$80 for a 6 GB data plan.⁴³ The availability of low-price, low-data plans may also encourage some individuals or households without Internet access to subscribe.⁴⁴ However, according to a recent survey by Pew Research, only 9

percent of non-Internet users cited price as a reason for not accessing the Internet,⁴⁵ suggesting that the availability of low priced plans may not substantially increase the number of new Internet subscribers.

The extent to which mobile and fixed Internet customers have benefitted from low-cost low-data plans is unclear at this time.

- While mobile customers can select a wide range of data plans, customers who may potentially benefit from the reduced prices of low-data plans may not be taking advantage of them. For example, one mobile provider we interviewed said that a “small percentage” of its customers are on 500 MB or smaller data plans.⁴⁶ Yet, according to Cisco, about 25 percent of mobile customers use less than 200 MB of data a month.
- Fixed internet customers—who as mentioned generally face less choice in providers than mobile customers do—generally have fewer plan options than mobile customers, especially for low-cost, low-data plans. However, it appears that a small percentage of customers subscribe to such options even though, according to FCC data, 30 percent of cable Internet customers use about 25 GB of data a month or less, meaning they could potentially take advantage of such plans. Another reason why subscribers may not choose the low-data plan at a discount is because the cost per GB of data is high and the small discount (of at most 20 percent of the unlimited data plan price) may not be worth the significant restriction in data usage from unlimited data. Further, only two fixed providers we interviewed offer data plans near or below the levels of median household data usage reported by FCC⁴⁷.

FCC’s Open Internet Advisory Committee studied the issue of usage-based pricing and, believing that more fixed Internet customers could be affected by UBP in the future, recommended in August 2013 that FCC monitor fixed provider application of UBP.⁴⁸ FCC collects some relevant data—such as on plan prices and data allowances used by selected fixed providers.⁴⁹ While FCC officials said that they will consider how they can use these data in the future, at this time FCC only uses these data to set a benchmark to ensure that providers receiving universal service funding are providing broadband services in rural areas at prices comparable to those in urban areas. FCC does not track providers’ use of UBP as FCC only recently started collecting data for the specific purpose mentioned above. For example,

FCC is not analyzing the data to determine how many providers utilize UBP, levels of data allowances, and how those allowances compare to average data consumption. As mentioned earlier, the Telecommunications Act of 1996 calls on FCC to promote the public interest in the provision of telecommunications services. Because FCC is not conducting any broader analysis with these data, it may not have a full understanding of how UBP is being used and its effects on consumers. This lack of understanding may limit FCC's ability to act to protect the public interest if necessary.

Some Industry Stakeholders Believe UBP Could Have Adverse Effects on Innovation and Network Security

Two industry stakeholders we interviewed also suggested that fixed providers—many of whom also provide television video content—could use UBP as a means to raise the price for watching online streaming video services—a competitor to their video services—as households continue to substitute television with streaming video. Because UBP can make it more expensive to watch data-heavy content such as streaming video, it may discourage people from accessing such content and, therefore, discouraging them from eliminating their television service. This might adversely affect firms that provide online video streaming services and reduce competition and innovation in the market for providing streaming video content, thereby negatively affecting consumers.

In addition, two industry stakeholders we interviewed believe UBP could in general inhibit innovation that results from experimentation and unlimited access to the Internet. Greater innovation could result in the development of more content and applications that consumers demand and value. Some Internet users, such as heavy data users, may pay more for access under UBP. As a result, some of them may limit their Internet use—as mentioned earlier, some focus group participants said that they have reduced their mobile data usage as a result of UBP—particularly of data-heavy content and applications such as online learning and video. This could lead to reduced use of some beneficial Internet applications and innovation in such applications. For example, one public interest group said that the limits that UBP may impose on the market for innovative applications and content may limit the potential of new startups.

One of the mobile providers we reviewed has entered into agreements with selected content providers so that the content provider's data does not

count toward customers' data allowances.⁵⁰ When presented with such a hypothetical situation, while some focus group participants expressed confusion over how such an arrangement might work, we found participants in all eight groups who agreed that they would be more likely to access content that does not count toward their data limits than content that does. Two industry stakeholders we interviewed suggested that such agreements would favor large established companies and reduce innovation or competition.

Furthermore, UBP could have negative effects on network security. According to a 2012 study, UBP may result in consumers—in an attempt to reduce data usage—foregoing automatic security updates to their computers, which could have negative implications for network security.⁵¹

CONCLUSION

Consumers who are subject to UBP need to understand their data usage and needs in order to make an informed decision about what is best for them. The confusion over data usage exhibited by consumers in our focus groups, as well as inconsistencies in estimates on the data certain applications use, and the fact that “hidden” data usage can result in consumers' using more data than expected, can make it difficult for consumers to make informed decisions regarding their data plan and could result in consumers exceeding their data allowance and facing overage charges. Mobile customers benefit from a voluntary code of conduct that FCC helped facilitate to guide provider actions and consumer education. Such a code helps enable more consistent and transparent information provided to consumers. Because no code of conduct exists for fixed providers, there is less assurance that information provided to consumers is clear, consistent, and transparent, potentially leading to consumer confusion over data usage and poor decisions regarding data plans.

Although few fixed Internet customers are affected by UBP at this time, the number could grow to the extent that fixed Internet providers increase their use of UBP and data use grows. Providers could implement UBP in a way that benefits consumers—for example, by offering low-data, low-cost plans for customers who do not want to pay for an unlimited data plan they do not need. However, providers—especially those facing limited competition—could use UBP as a means to increase their profits which could result in UBP having negative effects, including increased prices paid by consumers, reductions in content and applications accessed by consumers, and increased threats to network security.

Because fixed Internet customers generally have limited choice of providers, they may be unable to switch providers to select a data plan that best meets their needs. While focus group participants have adapted to mobile data plans, they and other consumers may have a harder time adapting to fixed-Internet UBP given the limited choice among providers and challenges in reducing data usage—as consumers have done for mobile Internet—at home if needed. While FCC has been collecting relevant data on the use of UBP, including information on data allowances, FCC is not using the data to gain an understanding of how UBP is being used and what its potential effects are on consumers. Without this market knowledge, FCC would not necessarily be able to take appropriate action if UBP is being used in a way that is harmful to consumers.

RECOMMENDATIONS

To ensure that application of UBP for fixed Internet access does not conflict with the public interest, we recommend that the FCC:

- 1) Collaborate with fixed Internet providers to develop a voluntary code of conduct, similar to the Wireless Code of Conduct, to improve communication and understanding of data use and pricing by Internet consumers.
- 2) Make use of existing data collection sources to track fixed-Internet UBP implementation and its effects on consumers nationwide so that FCC can take actions, if necessary, to protect consumer interests.

AGENCY COMMENTS AND OUR EVALUATION

We provided a draft of this report to FCC for review and comment. FCC provided a written response as well as technical comments that we incorporated as appropriate. In response to our recommendation that FCC collaborate with fixed Internet providers to develop a voluntary code of conduct for consumer communication, FCC said that because the number of consumer complaints regarding UBP by fixed providers appears to be small and that UBP plans are less common for fixed Internet customers than mobile customers, it is unclear that any action is needed at this time. FCC added it

will continue to monitor its complaints and provider offerings for trends that might indicate that more action is needed. We recognize that UBP plans are less common for fixed Internet customers than mobile, but believe additional action is warranted as we recommended. Given the trend toward greater use of UBP by fixed providers, increased data usage, confusion by consumers regarding data usage, our previous findings that consumers may not know to file complaints with FCC, and the potential that limited competition among fixed providers could result in their using UBP in ways that harm consumers, we continue to believe that it is important for FCC to be more proactive. For mobile Internet, FCC worked with providers to improve consumer education regarding data through the Consumer Code for Wireless Service only after many consumers faced significant problems with their data usage. We believe FCC has an opportunity to protect consumers before significant problems occur by collaborating with fixed Internet providers now to develop a code of conduct.

Secondly, in response to our recommendation that FCC use existing data sources to track UBP implementation, FCC agreed to do so but noted that its two data gathering efforts that collect some data relevant to UBP—the Urban Rates survey and Form 481—were both designed for other purposes. FCC added that as a result, while these efforts would allow it to conduct some analyses regarding UBP—such as plans offered by providers and the terms of those plans—it would not be able to conduct certain analyses, such as the number of subscribers subject to UBP. We agree that FCC should analyze the existing data as best as it can, taking into account such limitations. However, we also believe that in conducting such analyses, FCC, to the extent possible should consider using other existing data as well—such as data on median data consumption—to make the analyses as meaningful as possible.

Sincerely yours,
Mark Goldstein
Director, Physical Infrastructure Issues

APPENDIX I: OBJECTIVES, SCOPE, AND METHODOLOGY

To review what information is available about the application of usage-based pricing by Internet service providers, we reviewed information on the current consumer Internet data plans¹ of the largest 13 fixed and 4 mobile providers² in order to cover 98 percent of each market.³ To determine market

shares among fixed providers, we used data from the first quarter of 2014 on subscribership levels reported by Leichtman Research Group, a private research firm specializing in the telecommunications industry.⁴ To determine mobile provider market shares, we used data on 2012 subscribership numbers by provider as reported by the Federal Communications Commission (FCC) in its 16th Mobile Competition Report. We collected plan information on each provider's public website, validated it with each provider during an interview, and then confirmed the information with each provider again in October 2014. Information we collected included plan terms and conditions relevant to UBP as applicable, such as data allowances, connection speeds, and overage charges or other consequences for customers exceeding their allowances. Information on Internet plans, including data allowances, was valid as of October 2014, but could change at any time. We also interviewed these providers about the extent to which they use UBP and the specifics of their data plans. Finally, we interviewed the FCC regarding these issues, as well as FCC's role regarding UBP.

To review issues related to usage-based pricing that selected consumers report are important to them, we contracted with a private market research firm to assist with screening, recruiting, and holding focus groups with Internet consumers. We held two focus groups in each of the following cities: Baltimore, MD; Des Moines, IA; Las Vegas, NV; and New York, NY. The cities were selected to ensure diversity in geographic location and population of metropolitan areas. In each city, we held one group with self-identified "light" users and one group with self-identified "moderate" and "heavy" users, based on definitions from FCC.⁵ Potential participants were screened to ensure that they had both mobile Internet data plans as well as in-home broadband service. We also recruited participants in order to ensure a mix of age, race, sex, education level, and income level. Each of the eight groups contained 9 to 10 participants for a total of 77.

Focus group discussions were structured and guided by a moderator who used a standardized list of questions to encourage participants to share their thoughts and experiences with UBP. Specifically, question topics included participants' use of fixed and mobile Internet, their experiences with fixed and mobile UBP, and their opinions of and experiences with fixed and mobile UBP. To ensure participants understood the terminology used in the group discussions, we began each session by presenting copies of figures 1 and 2 in this report and clarifying the differences between fixed and mobile Internet to the participants. During the sessions, we assured participants of the anonymity of their responses, promising that their names would not be used. We also

conducted one pretest focus group at GAO and revised the moderator's guide prior to beginning our focus groups sessions.

Each of the eight focus groups was transcribed, which served as the record for each group. Those transcripts were then evaluated using content analysis to develop our findings. Our analysis focused on categorizing the common themes and statements made across the focus groups and quantifying those categories to gain an understanding of the predominant viewpoints expressed by the participants. The analysis was conducted in two steps. In the first step, two analysts independently developed a codebook and then worked together to resolve any discrepancies. In the second step, an analyst coded each transcript and then a second analyst verified those codes. Any coding discrepancies were resolved by both analysts agreeing on what the codes should be.

Methodologically, focus groups are not designed to (1) demonstrate the extent of a problem or to generalize results to a larger population, (2) develop a consensus to arrive at an agreed-upon plan or make decisions about what actions to take, or (3) provide statistically representative samples or reliable quantitative estimates. Instead, focus groups are intended to generate in-depth information about the reasons for the focus group participants' attitudes on specific topics and to offer insights into their concerns about and support for an issue. The projectability of the information produced by our focus groups is limited for several reasons. First, the information includes only the discussions from the Internet consumers in the eight groups. Second, while the composition of the groups was designed to ensure a range of age and education levels, the groups were not randomly sampled. Third, participants were asked questions about their experiences or opinions, and other Internet consumers not in the focus groups may have had other experiences or opinions.

In order to review the potential effects of UBP on consumers, we completed a literature search to obtain and review documentation, research papers and studies, and articles related to the use of UBP and its potential effects. Our search looked for relevant work, including economic literature, articles in scholarly journals, and industry publications, published in the past 5 years and used search terms including "data cap," "throttling," and "usage-based pricing." We reviewed these papers and their methodologies to determine their reliability. We interviewed the 4 mobile and 13 fixed providers mentioned above regarding the potential effects of UBP on consumers. We also interviewed FCC as well as industry stakeholders including academics and researchers, public interest organizations, industry associations, and others. We determined industry stakeholders to interview based on our review

of published literature and studies, as well as based on recommendations from providers and other organizations we interviewed.

We conducted this performance audit from November 2013 to November 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

End Notes

¹ Broadband Internet throughput, typically referred to as “speed,” is described in download and upload capabilities and is measured by the number of bits of data transferred per second. Measures of data include megabits (MB) and gigabits (GB). Download speed refers to the rate at which data is transferred to the consumer. Upload speed refers to the rate at which data is transferred from the consumer to the Internet. FCC defined broadband as having download speeds of at least 4 megabits per second (Mb/s) and upload speeds of at least 1 Mb/s. See *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, Amended by the Broadband Data Improvement Act*, GN Docket No. 11-121, Eighth Broadband Progress Report, 27 FCC Rcd. 10342 (2012).

² Includes connections of a download speed of at least 3 Mb/s and an upload speed of at least 768 kilobits per second. Federal Communications Commission, *Internet Access Services: Status as of June 30, 2013* (Washington, D.C.: June 2014).

³ Cisco *Cisco Visual Networking Index: Forecast and Methodology, 2013-2018*, (June 10, 2014).

⁴ For the purposes of this report we refer separately to fixed and mobile Internet providers.

⁵ Our scope was limited to consumer Internet service. In addition, we did not include mobile pre-paid Internet plans or satellite Internet providers as they are a small part of the market.

⁶ Mobile providers included AT&T Wireless, Sprint, T-Mobile, and Verizon Wireless. Fixed providers included AT&T, BrightHouse Networks, Cablevision, CenturyLink, Charter, Comcast, Cox, Frontier Communications, Mediacom, Suddenlink, Time Warner Cable, Verizon, and Windstream.

⁷ For mobile market shares, we used data from FCC. See FCC, *Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services: 16th Report*, 28 FCC Rcd. 3700 (2013) (hereinafter 16th Mobile Competition Report). For fixed market shares, we used data reported by Leichtman Research Group, a private research firm specializing in the telecommunications industry. See <http://www.leichtmanresearch.com/press/052014release.html>. Accessed September 19, 2014.

⁸ The radio frequency spectrum is the resource that makes possible wireless communications and supports a vast array of commercial and government services.

- ⁹ Many of these devices can also connect to fixed Internet via a Wi-Fi connection. In this case, mobile Internet is used when these devices connect directly to the Internet through a cellular tower.
- ¹⁰ Wi-Fi (wireless fidelity) signals are radio waves that provide Internet access to devices equipped with compatible wireless hardware. Each Wi-Fi access point is identified by a unique hardware address. Nearby compatible devices are able to receive this information and use it to request Internet access.
- ¹¹ Cisco, *Cisco Visual Networking Index: Forecast and Methodology, 2013-2018* (June 10, 2014).
- ¹² Cisco, *Cisco Visual Networking Index*; Ericsson, *Ericsson Mobility Report; On the Pulse Of the Networked Society* (June 2014).
- ¹³ Data transfer rates (speeds) and the potential for congestion, can vary depending on a number of factors including the number of users on shared networks and device capability.
- ¹⁴ Members of the Open Internet Advisory Committee include consumer advocates, engineers, content providers, service providers, and equipment manufacturers. The Committee aids FCC in tracking developments related to the openness of the Internet. Federal Communications Committee, Open Internet Advisory Committee, *Open Internet Advisory Committee 2013 Annual Report* (Aug. 20, 2013).
- ¹⁵ *Communications Act of 1934, Act of June 19, 1934, ch. 652, 48 Stat. 1064 (1934), as amended by Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (1996) (codified as amended at 47 U.S.C. § 151).*
- ¹⁶ 47 U.S.C. § 257(b).
- ¹⁷ 47 U.S.C. § 257(b).
- ¹⁸ Additionally, among other responsibilities, the FCC's Consumer and Governmental Affairs Bureau conducts consumer outreach and education, promotes service provider transparency, and handles consumer complaints, its Wireline Competition Bureau's objectives include ensuring choice and fairness in the development of wireline telecommunications services, and its Enforcement Bureau handles consumer protection enforcement and local competition enforcement.
- ¹⁹ These providers generally charge a base fee for data, texting, and talking, as well as a fee for each device that accesses the account, known as device fees. Since the data can be shared among devices, one device could use up all of an account's data allowance.
- ²⁰ However, most providers we interviewed have acceptable, or excessive, use policies, under which they can take further action, including customer termination, if they deem the user is in contravention of these policies which can include excessive data use. Most providers do not have a clear threshold of data usage that they deem to violate an excessive use policy and reported they rarely take actions against consumers for such violations.
- ²¹ According to one fixed provider's website, 5 GB of data is equal to about 3 hours of streaming high-definition video or streaming 1,250 songs.
- ²² Some providers said that some segments of their customer base are not subject to data usage monitoring because the provider has not fully deployed the technology needed to do so yet. However, these providers intend to include all their customers in the future.
- ²³ Customers who previously had these unlimited plans before UBP was implemented have been able to continue to keep their unlimited data plans.
- ²⁴ However, one researcher we interviewed said that some consumers may intentionally over-buy data to avoid having to pay overage charges and to avoid the mental strain of having to think about their data usage.
- ²⁵ Peter Sevick, Net Forecast, *Empowering Internet Users to Manage Broadband Consumption* (June 2012).

- ²⁶ CTIA, Consumer Code for Wireless Service, as of 2014. Originally developed in 2003, CTIA periodically reviews and updates the code. For example, CTIA updated the Code in October 2011 to provide details calling on providers to send postpaid customers free usage alerts to help them avoid unexpected overage charges. The code only applies to the signatories of the code, which cover about 97 percent of subscribers.
- ²⁷ We recommended that FCC should clearly inform consumers about its complaint process. FCC is currently in the process of reforming its consumer complaint process and expects this effort to be completed by the end of 2014. GAO, *Telecommunications: FCC Needs to Improve Oversight of Wireless Phone Service*, GAO-10-34, (Washington, D.C.: Nov. 10, 2009).
- ²⁸ 47 C.F.R. § 8.3. The Transparency Rule requires Internet providers to sufficiently publicly disclose accurate information regarding the network management practices, performance, and commercial terms of their services so that consumers can make informed decisions regarding their use of Internet services.
- ²⁹ FCC, Enforcement Advisory: *Broadband Providers Must Disclose Accurate Information to Protect Consumers*, Public Notice, 29 FCC Rcd. 8606 (2014).
- ³⁰ The advisory states that the Transparency Rule “prevents a broadband Internet access provider from making assertions about its service that contain errors, are inconsistent with the provider’s disclosure statement, or are misleading or deceptive.” The Advisory also states that “advertisements and other public statements that broadband Internet access service providers make about their services” must be “accurate and consistent with any official disclosures that providers post on their websites or make available in stores or over the phone.”
- ³¹ The ACSI measures the satisfaction that U.S. consumers have with the quality of a number of different types of services, including Internet services. American Customer Satisfaction Index, *ACSI Telecommunications and Information Report 2014*, (Ann Arbor, MI: May 2014).
- ³² Among other factors scoring low and dropping in the 2014 ratings are: service interruptions, understanding bills, reliability and consistency of service, performance of internet during peak hours, provider website satisfaction, and call center satisfaction. Factors that increased, but still scored low relative to other consumer-industry satisfaction scores were overall data transfer speed and quality of video streaming.
- ³³ For example, based on one fixed provider’s online data estimates, a user visiting an average of 10 web pages a day would only consume about 96 MB of data from those visits.
- ³⁴ John Horrigan and Ellen Satterwhite, *Americans’ Perspectives on Connection Speeds for Home and Mobile Devices*, Summary of Finding, FCC (Washington, D.C.: June 2, 2010).
- ³⁵ Union des Consommateurs, *Limited Usage of Mobile Internet Access Services: Informing and Protecting Consumers* (Montreal, Quebec, Canada; June 2013).
- ³⁶ For example, older devices may be unable to access 4G networks that allow for more advanced online experiences.
- ³⁷ Andrew Odlyzko, Bill St. Arnaud, Erik Stallman, and Michael Weinberg, *Know Your Limits: Considering the Role of Data Caps and Usage Based Billing in Internet Access Service*, Public Knowledge (May 2012).
- ³⁸ According to Sandvine, these users view about 100 hours of streaming video a month. Sandvine *Global Internet Phenomena Report 1H 2014* (Waterloo, Ontario, Canada: May 15, 2014).
- ³⁹ Some of the fixed data allowances we reviewed are as low as 150GB.

- ⁴⁰ Federal Communications Commission, Office of Engineering and Technology and Consumer and Governmental Affairs Bureau, 2014 *Measuring Broadband America Fixed Broadband Report: A Report on Consumer Fixed Broadband Performance in the U.S.* (Washington, D.C.: June 2014).
- ⁴¹ FCC, *Internet Access Services: Status as of June 30, 2013* (Washington, DC: June, 2014). FCC considers all households in a given census tract as being able to get service from a provider if that provider offers service anywhere in that tract to create the number from which these data are drawn. However, many households may not have service from every provider operating in the tract. In addition, to the extent providers do not have subscribers at speeds of 6 Mb/s download and 1.5 Mb/s upload they are not counted as offering service in the tract at all. As a result, the figures do not necessarily reflect the number of provider choices available to any particular household.
- ⁴² Federal Communications Commission, *16th Annual Mobile Competition Report*, 28 FCC Rcd. 3700 (2013).
- ⁴³ These prices are for shared data plans that allow customers to share the data allowance among up to 10 devices. They also include unlimited talking and texting for all devices and include device fees of \$10 to \$40 per device per month, depending on the device.
- ⁴⁴ Lyons, Daniel A. *Internet Policy's Next Frontier: Data Caps, Tiered Service Plans, and Usage-Based Broadband Pricing*. Boston College Law School (March 26, 2013.)
- ⁴⁵ Pew Research, 2013.
- ⁴⁶ While the total price for such plans is lower than larger data plans, the price per GB of data is higher. For example, the price for one provider's 500 MB plan equates to \$60 per GB of data, while its 2 GB plan price equates to \$25 per GB of data.
- ⁴⁷ FCC reported median monthly usage of cable subscribers as 47.6 MB; median usage of subscribers to digital subscriber line service from phone companies as 21.9 MB; and median usage of subscribers to fiber optic service as 32.3 MB. FCC, *2014 Measuring Broadband America, Fixed Broadband Report* (Washington, D.C.: June 2014). One provider does offer a low-cost low-speed (5 Mb/s download) option for qualifying low-income consumers. However, subscribers to this option have to meet eligibility requirements.
- ⁴⁸ FCC, Open Internet Advisory Committee, *FCC Open Internet Advisory Committee 2013 Annual Report* (August 20, 2013).
- ⁴⁹ FCC collects relevant data from providers in urban areas from its Urban Rate Survey. It collects relevant data from providers in rural areas through its Form 481 data collection (Carrier Annual Reporting).
- ⁵⁰ For example, a mobile provider may enter into an agreement with a streaming audio service so that when that provider's customers access that streaming audio content, its data use does not count towards their data allowance. However, their use of streaming audio from other content providers may count.
- ⁵¹ Marshini Chetty, Richard Banks, A.J. Bernheim Brush, Jonathan Donner, and Rebecca E. Grinter, "You're Capped!" *Understanding the Effects of Bandwidth Caps on Broadband Use in the Home*. ACM Conference on Human Factors in Computing Systems (May 2012).

End Notes for Appendix I

- ¹ We only reviewed consumer plans and did not include commercial Internet services for business customers. In addition, we did not include mobile pre-paid Internet plans or satellite Internet providers as they are a small part of the market.
- ² The mobile providers were: AT&T Wireless, Sprint, T-Mobile, and Verizon Wireless. Fixed providers were AT&T, Bright House Networks, Cablevision, Century Link, Cox, Charter, Comcast, Frontier, Mediacom, Time Warner Cable, Suddenlink, Verizon, and Windstream.
- ³ See 16th Mobile Competition Report, *supra* note 7.
- ⁴ See <http://www.leichtmanresearch.com/press/052014release.html>. Accessed September 19, 2014.
- ⁵ FCC defines light use as basic functions such as e-mail, web surfing, and basic streaming video; moderate use as basic functions plus one high-demand application such as streaming high-definition video or online gaming; and heavy use as basic functions plus more than one high-demand application running at the same time. Because participants self-identified their use and may not have fully understood data usage, these identifications were imperfect, and we did not analyze results from the two types of groups separately.

