2025 Urban Rate Survey – Fixed Broadband Service

Introduction

Every year, the Wireline Competition Bureau (Bureau) and the Office of Economics and Analytics (OEA) (together, Bureau/OEA) conduct the fixed broadband Urban Rate Survey (broadband URS). The broadband URS collects data on rates for standalone Internet access service charged by a representative sample of fixed broadband providers in urban census tracts in the United States.[1]

The main purpose of the broadband URS is to produce broadband reasonable comparability benchmarks for every possible service tier (i.e., a service plan with specified minimum download speed, minimum upload speed, and monthly capacity allowance). These benchmarks serve as rate caps to "help ensure that universal service support recipients offering [fixed voice and] broadband services do so at reasonably comparable rates to those in urban areas."[2]

To calculate these benchmarks, the Bureau/OEA have, over the years, used sample design, data collection mode, edit checks, and estimation methodology consistent with what was adopted in 2013. In particular, the same fixed sample size of approximately 500 sampling units had been selected and the same benchmark definition had been used every year.

To account for the fact that the Bureau/OEA must calculate benchmarks for a much wider range of speeds than when the broadband URS was first initiated, since the 2022 broadband URS, the Bureau/OEA have increased the sample size to approximately 2,000 sampling units. Correspondingly, we have slightly modified the sample design and estimation methodology to better capture the variation in broadband service rates across the United States, thereby improving the quality of the benchmark estimates.

This methodology report follows the format of previous years' reports and describes how the Bureau/OEA calculated the fixed broadband reasonable comparability benchmarks for 2025.

Sample Design

Primary sampling unit and sampling frame

The 2025 broadband URS retains the same definition of primary sampling unit (PSU) as used in past survey cycles. That is, a PSU is a pair consisting of a broadband service provider and an urban census tract where the provider offers at least one terrestrial fixed broadband service tier to residential customers therein. In rare cases where this pair is distinguishable based on the provider's designation as both an incumbent local exchange carrier (ILEC) and a non-ILEC in the census tract, or the availability of both fixed wired and wireless service options, the PSU definition accommodates these distinctions.

As was done last year, Bureau/OEA staff developed the sampling frame for the 2025 broadband URS based on data from the Broadband Data Collection (BDC) system. Prior to the 2024 URS, staff used information from the FCC Form 477 data collection. The sampling frame uses data as of December of the year prior to data collection. The 2025 broadband URS frame consists of 284,508 PSUs, encompassing 1,083 service providers and 58,599 census tracts.

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[1] Prior to the 2023 URS, urban census tracts were defined as tracts with at least one populated block located within an urban area or urban cluster that is also located within a county designated as a metropolitan statistical area. Because the Census Bureau has updated the definition of urban areas using the results of the 2020 Census, the Bureau/OEA adopted a new definition of urban tracts: a 2020 tract is urban if at least 80 percent of its housing units are within a 2010 tract Urban Area that has a population of at least 50,000.

[2] *Connect America Fund*, WC Docket No. 10-90, Order, 28 FCC Rcd 4242 (WCB/WTB 2013).

Stratification
The broadband URS uses a stratified sample design. Stratification is the division of a heterogenous population (represented by the sampling frame) into subpopulations called strata, each of which is internally homogenous with respect to the population characteristic(s) of interest. When properly implemented, this commonly used sample design element can produce gains in precision in the estimates of characteristics of the whole population.[3]

The strata for the 2025 broadband URS are defined similarly as last year's. First, all Alaska sampling units form one stratum. Within the rest of the sampling units, separate strata are created for providers belonging to holding companies with the highest share of residential fixed broadband subscribership. Sampling units that do not belong to any holding company-based stratum are then assigned to a geographic stratum based on the census division where the census tract belongs. Because Puerto Rico is not in a census division, we treat it as its own stratum. In all, there are 22 strata in the 2025 broadband URS: an Alaska stratum, 11 holding company-based strata, and 10 census division-based strata, including Puerto Rico.

Sample Allocation
Like stratification, the allocation method for the 2,000 sample units in the 2025 broadband URS is also the same as last year's. First, in the Alaska stratum no sampling was conducted and all of its sampling units were surveyed. The remaining sample was allocated to the non-Alaska strata according to whether they are holding company- or geography-based. For holding company-based strata, staff examined the standard deviation of last year's price data from these companies and allocated the sample based on this number. For geography-based strata, staff allocated the remainder of the sample proportionally by their share of the estimated total number of potential subscribers.[4]

As was done previously, staff further adjusted the final allocation so that no holding company is allocated fewer than 20 or more than 80 samples. Having a lower bound for sample allocation avoids unreliable estimates due to small sample size, and having an upper bound controls the response burden.

Measure of Size and Sample Selection
The broadband URS implements probability sampling, i.e. every sampling unit has some chance of being selected in the sample, but not equal probability sampling, where every sampling unit has an equal chance of selection. Instead, the broadband URS sample design calculates a measure of size (MOS) for every sampling unit in the frame, and selects the sample independently within each stratum based on this MOS. Thus, for example, if sampling unit A has a MOS that is twice that of sampling unit B, then A is twice as likely to be selected in the sample compared to B. This type of unequal probability selection is called probability proportional to size (PPS) sampling.[5]

Continuing to use the definition adopted last year, staff also defined the measure of size for a sampling unit in the 2025 broadband URS as the number of residential service subscriptions in the census tract, as reported in the December 2023 BDC.

After completing the stratification, sample allocation, and measure of size calculation steps, staff then calculated the probability of selection for all sampling units. Sampling units with selection probability greater than or equal to 1 are separated and treated as certainty units. That is, they were included in the sample and not subjected to random sampling. Finally, staff implemented a standard algorithm for PPS sampling and selected the sample according to the allocation described above.[6]

[3] William G. Cochran, Sampling Techniques ch. 5 (3rd ed. 1977).

[4] *Id*. at 96-99.

[5] *Id*. at 251.

[6] *Id*. at 265-266.

Table 1 provides information on the sample design for the 2025 broadband URS.

Table 1 2025 Broadband URS Sample Design

Strata	Frame			Sample		
	Sampling Units	Providers	Census Tracts	Sampling Units	Providers	Census Tracts
AT&T	43,822	10	33,462	60	8	60
Altice	3,987	1	3,987	60	1	60
Charter	21,311	1	21,311	30	1	30
Comcast	26,604	2	26,600	60	2	60
Cox	5,460	1	5,460	50	1	50
Frontier	5,669	1	5,669	60	1	60
Google	2,308	11	2,228	60	10	60
Lumen	12,180	2	7,953	30	2	30
Radiate	3,264	10	3,264	55	9	55
T-Mobile	57,285	1	57,285	60	1	60
Verizon	64,444	9	55,052	35	8	35
New England	1,232	32	817	30	12	30
Middle Atlantic	1,935	67	1,625	63	22	62
East North Central	5,231	175	3,981	217	34	216
West North Central	3,557	149	1,574	143	34	137
South Atlantic	4,589	144	3,437	224	46	222
East South Central	1,697	72	1,213	96	27	96
West South Central	3,932	174	2,308	85	29	82
Mountain	5,412	158	2,974	105	40	101
Pacific	5,796	174	4,289	126	35	126
Puerto Rico	4,552	42	784	110	8	110
Alaska	241	6	77	241	6	77
Overall	**284,508**	**1,083**	**58,599**	**2,000**	**280**	**1,809**

Survey Response

This section describes how the sample of 2,000 sampling units responded to the 2025 broadband URS.

This year, there are 8 ineligible sampled units because the selected provider did not offer, or stopped offering, fixed broadband service in the selected census tract. Of the remaining 1,992, 127 did not respond to the survey. Thus, the overall response rate is (1,992 - 127) / 1,992 = **93.6%**.

The first two rows of Table 2 show the number of responses, the number of different service providers, and the number of different census tracts requested and received at the close of data collection for the 2025 broadband URS. The third row shows the corresponding counts for valid responses (i.e., where the monthly recurring price is neither missing nor zero).

Table 2 Survey Response Summary

Survey Status	Responses	Service Providers	Census Tracts
Requested	2,000	280	1,809
Received	1,865	253	1,690
Service Provided	1,863	252	1,688

After conducting edit checks, including the removal of submitted rate data for business instead of residential plans and those rates where download speed is either less than 2 megabits per second (Mbps) or less than upload speed, 1,863 responses had useable unique monthly rates. Monthly rates were treated as unique for a combination of census tract, FCC Registration Number (FRN), service name, technology, download speed, upload speed, and capacity allowance. A total of 13,011 unique monthly rates were used to estimate the 2025 broadband comparability benchmarks.

Table 3 shows summary information on how these 13,011 unique monthly rates used to fit the average rate model distribute by technology.

Table 3 Counts of Monthly Rates by Technology

Technology	Responses	Service Providers	Census Tracts	Rates
Cable	874	82	872	5,004
DSL (Digital Subscriber Line)	440	54	440	2,258
Fixed Wireless	201	40	181	954
FTTH (Fiber to the Home)	1,057	203	1,046	4,795
Overall	**1,863**	**252**	**1,688**	**13,011**

Monthly Rates and Rate Spreads

The main analysis variable for the broadband URS is the monthly rate which broadband providers charge their customers in urban census tracts. It is common, however, for providers to offer multiple service tiers in the same census tract at different monthly rates. For this reason, the survey asks for the minimum and maximum of these rates and calculates an "average" monthly rate based on these two extreme values. Specifically, the following equations are used to calculate this average monthly rate, if the service provider offered multiple rates in the census tract:

- Minimum Rate = Minimum Monthly Charge + Minimum Other Mandatory Charge + Minimum Surcharge
- Maximum Rate = Maximum Monthly Charge + Maximum Other Mandatory Charge + Maximum Surcharge
- Rate Spread = Maximum Rate - Minimum Rate
- Average Rate = (Minimum Rate + Maximum Rate)/2

The following equations were used if the service provider did not offer multiple rates in the census tract:

- Average Rate = Minimum Monthly Charge + Minimum Other Mandatory Charge + Minimum Surcharge
- Rate Spread = 0

Weights

The broadband URS uses weights to ensure the contributions of each response properly represent the service plans that consumers in urban tracts possibly receive. Weights also ensure that a service provider's rates do not exert extra influence on the benchmark estimates only because the provider offers different service plans using multiple technologies.

The 2025 broadband URS weight construction is consistent with the method used in previous years. That is, each rate was assigned a weight based on the following equation:

Weight = Sampling Weight x Non-response Weight x Same Rate Weight x Service Level Weight x Number of Service Subscribers

Sampling Weight is the inverse of the selection probability for each sample unit. The selection probability is determined by the sample size in each stratum, the number of service subscribers described in the sample selection section earlier, and the total number of service subscribers in each stratum.

Non-response Weight is assigned to each stratum in order to compensate for unit non-response in each stratum. It is the total number of service subscribers sampled over the total number of service subscribers in the sampled census tracts of a given provider who has provided rate responses in each stratum.

Same Rate Weight is assigned to the respondents that provided i) multiple service levels or ii) equal service levels via different technologies for the same rate in the same census tract.[7] In such cases, the rate was assigned a Same Rate Weight equal to 1/R, where R is the number of rate responses provided by a service provider at the same rate in the census tract.

Service Level Weight is assigned to the respondents who provided multiple rates for the same service level offered via different technologies and/or service names. Each rate was assigned a Service Level Weight equal to 1/L, where L is the number of responses with different rates provided by a service provider for the same service plan (same download bandwidth, upload bandwidth, and monthly capacity allowance) in the census tract.

Number of Service Subscribers is the number of service subscribers in the tract.

The final weight is the product of Sampling Weight, Non-response Weight, Same Rate Weight, Service Level Weight, and the Number of Service Subscribers.

Average Rate Model

As in previous broadband URS rounds, the 2025 URS price data show that broadband rate is nonlinear with respect to download speed and upload speed (*see* Appendix A). Thus, to estimate an average rate for every possible broadband service level, especially those of interest to the Bureau, staff continued to apply a weighted Generalized Boosted Model (GBM) that was first used in the 2017 broadband URS.[8]

[7] Such a situation could arise when a provider uses different technologies to provide similar services to customers in different parts of a census tract.

[8] *See* Appendix B.

Staff fit this year's model using data for non-discounted prices for residential service. Table 4 shows the range, weighted mean, and weighted standard deviation of these rates, as well as the weighted mean download speed for different technologies.

Table 4 Monthly Rates Summary Statistics by Technology

Technology	Min	Max	Rate, weighted mean	Rate, weighted standard deviation	Download speed, weighted mean
Cable	9.95	320.00	86.74	31.43	606.56
DSL	24.95	169.98	70.80	18.55	50.20
Fixed Wireless	24.95	299.99	83.57	37.54	69.68
FTTH	9.95	850.00	118.17	68.45	1,677.00
Overall	**9.95**	**850.00**	**92.04**	**43.09**	**771.14**

This year's weighted GBM has the same form as last year's and is given by the following equation:[9]

$$\text{Average Monthly Rate (\$)} = Y = f(D, U, A, ST)$$

where *D* is download speed in Mbps, *U* is upload speed in Mbps, and *A* is the inverse of monthly capacity allowance in gigabytes (GB), and *ST* is the stratum. Once fit, the GBM predictions are used to estimate the U.S. average monthly rate as follows:

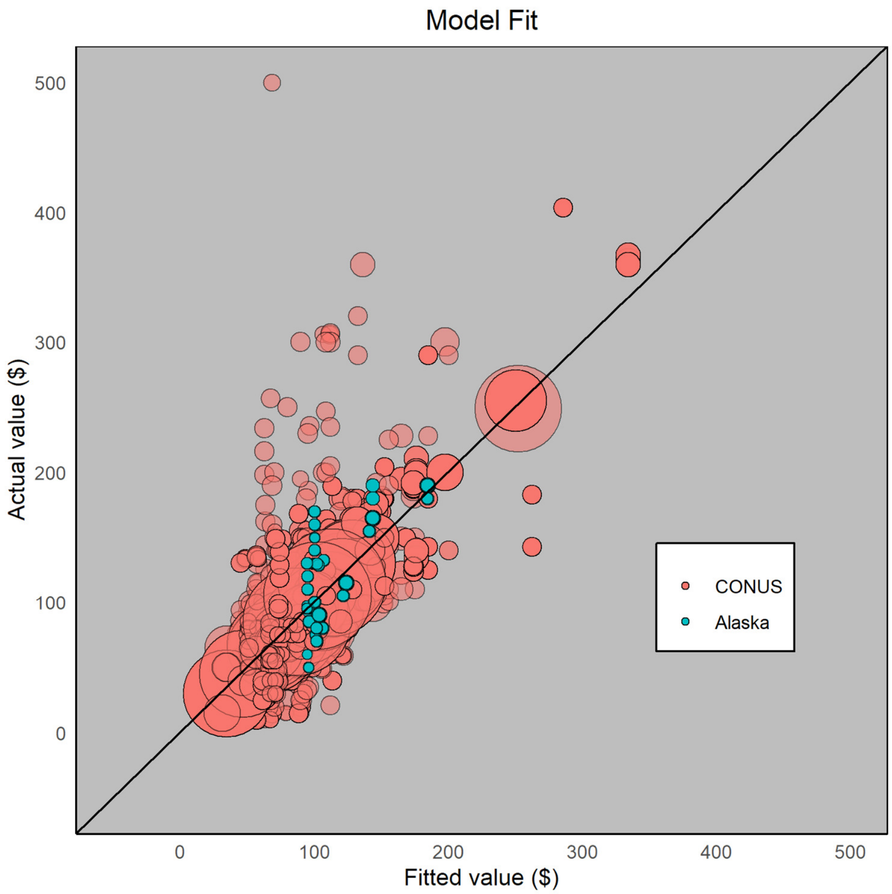
$$\text{U.S. Average Monthly Rate (\$)} = \sum_{i=1}^{n} \gamma_i \, E(Y \mid D, U, A, ST = ST_i)$$

where $n = 21$, which represents the 21 strata in the continental United States, as shown in the sample design summary table, Table 1. $E(Y \mid D, U, A, ST = ST_i)$ is the expected value conditioned on combinations of download speed, upload speed, and capacity allowance for a given stratum, and γ_i is the proportion of total continental U.S. residential service subscribers in a given stratum.

Figure 1 shows how the model fits the raw data. The closer the dots are to the 45-degree line, the better the fit. The size of the circles represents the weights of the sample rates.

[9] The R package gbm (Generalized Boosted Regression Models) was used to perform model fitting. Half of the price data were used as training set and the other half as validation set for each regression tree phase. Multiple GBM models were constructed and compared. The final model was selected based on the out-of-bag error statistic, which is a method of measuring the prediction error of boosted decision trees. The optimal number of trees of the final models are 475 for CONUS and 476 for Alaska.

Figure 1
2025 Broadband URS Average Rate Model Fit



Reasonable Comparability Benchmark

Under the methodology previously adopted by the Bureau, the reasonable comparability benchmark is the estimated average monthly rate plus twice the standard deviation of rates for terrestrial fixed broadband service plans with download bandwidths of 10 Mbps or greater, upload bandwidths of 1 Mbps or greater, and meeting or exceeding the minimum monthly usage allowance.[10]

The root weighted mean squared residual (RWMSR) is an estimate of the standard deviation of rates for service plans meeting the reasonable comparability benchmark criteria. As before, RWMSR values are calculated separately for the continental U.S. (CONUS) and Alaska. Table 5 shows the final RWMSR values for this year's models.

Table 5. 2025 Broadband Models' Root Weighted Mean Square Residuals

Model	RWMSR
CONUS	6.23
Alaska	19.93

[10] RWMSR is the square root of the weighted average of the square of residuals (observed rate minus average rate as defined by the Average Monthly Rate equation) plus the square of the spreads divided by 12.

Following the definition adopted by the Bureau, the U.S. and Alaska reasonable comparability benchmarks are calculated as follows:

U.S. reasonable comparability benchmark ($) = U.S. Average Monthly Rate + 2 ($RWMSR_{ContinentalUS}$)

= U.S. Average Monthly Rate + 12.46

AK reasonable comparability benchmark ($) = AK Average Monthly Rate + 2 ($RWMSR_{Alaska}$)

= AK Average Monthly Rate + 39.86

The average monthly rate estimator is described in the previous section.

Reasonable Comparability Benchmark Results

Table 6 below provides examples of reasonable comparability benchmarks (rounded up to the nearest cent) for several service plan levels. The estimates are available for a reasonable comparability benchmark for lower download speeds (greater than or equal to 4 Mbps) if needed and up to download speeds of 2,000 Mbps. Upload speed may not exceed download speed.

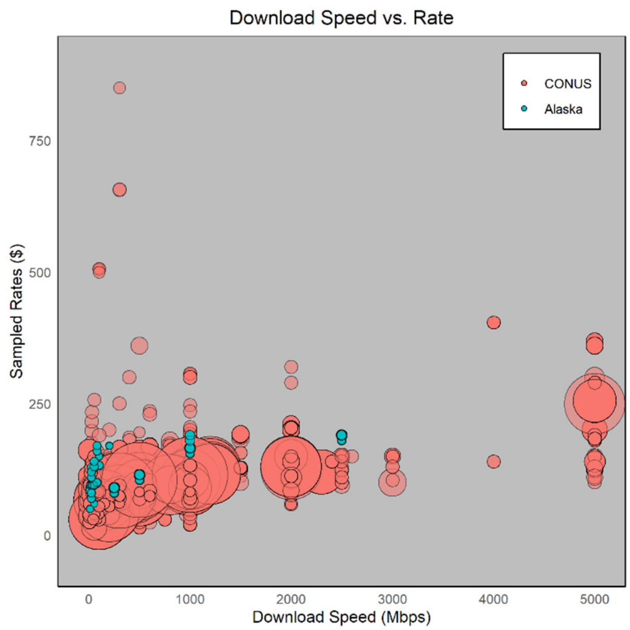
Table 6
2025 Broadband Benchmarks for Select Service Plan Levels

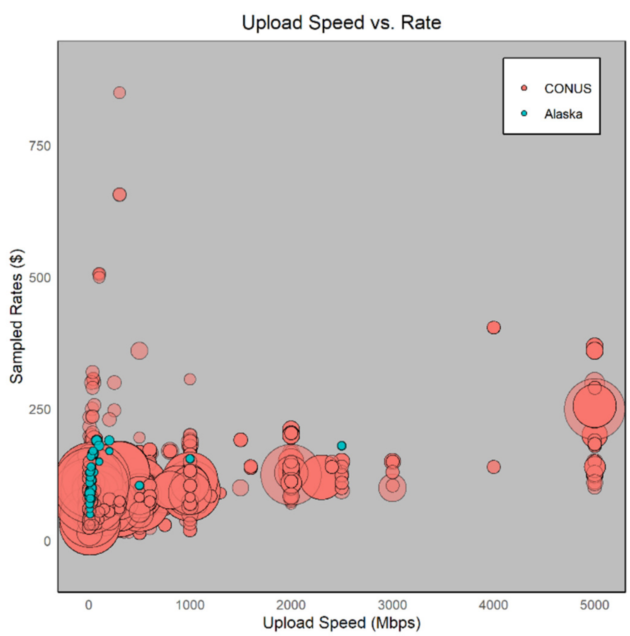
Download Speed (Mbps)	Upload Speed (Mbps)	Capacity Allowance (GB)	2025 U.S.	2025 Alaska
4	1	720	89.51	147.09
4	1	Unlimited	89.51	147.65
10	1	720	89.78	147.44
10	1	Unlimited	89.78	148.00
25	3	720	87.58	148.89
25	3	Unlimited	87.58	149.45
25	5	720	87.58	148.89
25	5	Unlimited	87.58	149.45
50	5	720	87.58	148.89
50	5	Unlimited	87.58	149.45
100	10	Unlimited	85.39	145.29
100	20	720	85.85	144.67
100	20	Unlimited	85.85	145.40
250	25	Unlimited	91.70	147.81
500	50	Unlimited	106.87	164.38
1000	100	Unlimited	122.63	182.24
1000	500	720	117.57	180.07
1000	500	Unlimited	117.57	180.07
1000	1000	Unlimited	116.85	180.00
2000	1000	Unlimited	145.80	209.03

APPENDIX A

The 2025 URS modeled rates by download speed and by upload speed. Over this large range, the rates are not linear functions of either quantity. The size of the circles in the plots below represents the weights of the sample rates. Sampled rates represent common services provided to the customers and do not include all possible combinations of download bandwidth, upload bandwidth, and monthly capacity allowance.

Figure 2 2025 Broadband URS Download and Upload Speeds vs Rates





APPENDIX B

A Generalized Boosted Model (GBM) is a machine learning algorithm that combines regression trees and gradient boosting techniques. The GBM framework does not assume a specific pattern between the independent variables and the dependent variable. It illustrates nonlinearity and interactions well without the need to define complex mathematical equations.

The algorithm first selects a portion of data to train a regression tree model (regression tree phase). The regression tree model used in GBM is usually a stump-only model or with only very few branches. Then, it uses the unselected data to validate the model and output a user defined performance statistic or loss function (validation phase).

The algorithm repeats the same procedure on the residuals from the previous modeling phases until the performance gain stabilizes or loss function optimizes (gradient boosting phase). The outputs of a GBM are model fits from a series of regression tree models. Therefore, conventional coefficients are not applicable.

Independent variable collinearity and data outliers have very little impact on the model fit because only the most influential variables are selected during each regression tree phase (only one most influential variable is selected if fitting a stump-only model). The interactions are naturally embedded in the structure of a series of regression tree models. Overfitting is safeguarded by inserting a cross-validation technique. Therefore, the GBM algorithm is considered to have high predictive accuracy. However, its predictive performance is weakened when the relationship between an independent variable and the dependent variable is very linear.

More information about GBM can be found in the following references:

Y. Freund and R.E. Schapire. 1997. A decision-theoretic generalization of on-line learning and an application to boosting. Journal of Computer and System Sciences. 55(1):119-139.

G. Ridgeway. 1999. The state of boosting. Computing Science and Statistics. 31:172-181.

J.H. Friedman, T. Hastie, and R. Tibshirani. 2000. Additive Logistic Regression: a Statistical View of Boosting. Annals of Statistics. 28(2):337-374.

J.H. Friedman. 2001. Greedy Function Approximation: A Gradient Boosting Machine. Annals of Statistics. 29(5):1189-1232.

J.H. Friedman. 2002. Stochastic Gradient Boosting. Computational Statistics and Data Analysis. 38(4):367-378.