2022 Urban Rate Survey – Fixed Voice Service

Introduction

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

The main purpose of the voice URS is to produce a national benchmark, called the "reasonable voice comparability benchmark." This benchmark serves as a rate cap 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]

Consistent with the methodology adopted,[3] the Bureau/OEA continued to calculate the reasonable voice comparability benchmark this year by estimating the national average local flat rate, including subscriber line charges (SLCs), and adding to it twice the estimate of its standard deviation.

For 2022, the reasonable comparability benchmark for fixed voice service is **$52.65**.

This document describes in detail how this benchmark was calculated based on data from the 2022 voice URS.

Sample Design

Primary sampling unit and sampling frame

The 2022 voice URS retains the same definition of primary sampling unit (PSU, or "sampling unit") as used in past survey cycles. That is, a PSU is a pair consisting of a voice service provider and an urban Census tract where the provider offers at least one fixed voice service 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, the PSU definition accommodates this distinction.

As in previous years, the Bureau/OEA developed the sampling frame[4] for the 2022 voice URS based on data from the FCC Form 477, as of December of the year prior to data collection, together with information from the ILEC study area boundary data collections.[5] The 2022 voice URS frame consists of 111,577 sampling units from 666 service providers and 54,769 Census tracts.

Stratification

[1] Census 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.

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

[3] *See* 2014 Urban Rate Survey Methodology *available at* https://apps.fcc.gov/edocs_public/attachmatch/DA-14-520A3.pdf. In April 2019, the Commission eliminated the rate floor requirement. *See Connect America Fund*, WC Docket No. 10-90, Report and Order, 34 FCC Rcd 2621 (2019).

[4] A sampling frame, or frame for short, is a list of all primary sampling units.

[5] We excluded Census tracks without residential households.

The voice URS uses a stratified sample design. Stratification is the division of a heterogenous population (represented by the sampling frame), into subpopulations called strata (singular: stratum), 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.[6]

In previous years, the Bureau/OEA has stratified the voice URS sampling frame based on the provider's status as either ILEC or non-ILEC. This stratification, however, disproportionately results in regular increases in the number of sampling units selected for the country's major provider of voice service in urban areas, namely AT&T. Because historical data suggest that there is little variation in the rates charged by AT&T, selecting more samples from this provider, and therefore selecting fewer from other providers, does little to achieve the goal of stratification.

For this reason, the Bureau/OEA carved out a separate stratum for AT&T in the 2022 voice URS. Thus, this year, there are four strata:

- AT&T and ILEC;
- AT&T and Non-ILEC;
- Non-AT&T and ILEC; and
- Non-AT&T and Non-ILEC.

The table on the next page shows summary information on these strata.

Sample Allocation

Consistent with sampling procedures used in prior voice URS cycles, the Bureau/OEA applied proportional allocation[7] to determine how many sampling units to select from each stratum. Based on Bureau/OEA staff analysis of historical data, 50 of the fixed sample size of 500 sampling units for the voice URS were apportioned to the AT&T strata, while the rest were apportioned to the non-AT&T strata. These sample counts were then allocated to the respective ILEC and non-ILEC strata in proportion to the number of sampling units in the stratum.

The table on the next page includes information on the sample allocation for the 2022 voice URS.

Measure of Size and Sample Selection

The voice URS implements probability sampling, which means that every sampling unit has *some* chance of being selected in the sample. However, it does not use equal probability sampling, where every sampling unit has an *equal* chance of selection. Instead, the voice 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.[8]

Following historical procedures, the Bureau/OEA calculated the MOS for the 2022 voice URS sampling units (which, as described above, are pairs of provider-Census tract) by estimating the provider's number of potential subscribers in the Census tract.

Number of Potential Subscribers = Provider Presence Ratio x (Number of households in the sampling unit's Census tract)

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

[7] *Id*. at 91.

[8] *Id*. at 251.

The Provider Presence Ratio for an ILEC sampling unit was calculated as the fraction of residential provider's subscribers in the Census tract relative to the total number of residential subscribers for all providers in the Census tract. This ratio is 1 if the provider has monopoly in the Census tract.

The Provider Presence Ratio for a Non-ILEC sampling unit is more complicated because Non-ILEC providers are generally able to define their own service areas. We therefore needed a proxy for the portion of households in the Census tract that a Non-ILEC provider covers (i.e., the Provider Presence Ratio). To do this, we used a regression model to estimate the proportion of the Census tract's households to which a Non-ILEC provider offers voice service. Like the 2021 survey, the regression model for the 2022 voice URS was also developed based on FCC Form 477 data relating broadband provider presence to broadband provider subscription with state variations.[9] The resulting equation was then used to create a Provider Presence Ratio equation. A Provider Presence Ratio was calculated for each Non-ILEC sampling unit using the following formula:

$$\text{Provider Presence Ratio} = \frac{1}{1+10^{-Y}}$$

where

$$Y = b_0 + b_1 * \text{Log}_{10}\left(\frac{X}{1-X}\right) + r_n * \text{state}_n$$

X = proportion (percentage) of residential subscribers subscribing to a given provider in a tract, which is calculated as number of residential subscribers for provider in the tract divided by number of households in the tract.

State = indicators of which state the residential subscribers are in.

The b_0, b_1, and r_n are model coefficients. The model coefficients are included in the Appendix.

In either case, the number of potential subscribers may not exceed the number of households in the sampling unit's Census tract.

After completing the stratification, sample allocation, and measure of size calculation steps, the Bureau/OEA selected the final sample using SAS proc surveyselect with systematic PPS selection option.[10] The procedure selected a total of 500 sampling units.

The table on the next page summarizes the sample design for the 2022 voice URS.

	Stratum	Units	Providers	Census Tracts	Number of Potential Subscribers
Frame	Overall	111,577	666	54,769	155,489,807
	AT&T & ILEC	27,143	9	27,143	43,571,318
	AT&T & Non-ILEC	9,605	2	9,605	11,862,007

[9] Linear regression was used to regress $\text{Log}_{10}\left(\frac{p}{1-p}\right)$ on $\text{Log}_{10}\left(\frac{s}{1-s}\right)$ where p is the fraction of housing units covered by the broadband provider in the Census tract and s is the provider's broadband subscriber fraction of households in the tract. This assumes that the relationship of voice provider presence to voice subscribership is similar to that of broadband provider presence to broadband subscribership.

[10] The SURVEYSELECT Procedure, SAS User's Guide, https://documentation.sas.com/doc/en/pgmsascdc/9.4_3.3/statug/statug_surveyselect_toc.htm.

	Non-AT&T & ILEC	28,378	406	26,900	43,332,159
	Non-AT&T & Non-ILEC	46,451	276	33,415	56,724,322
Sample	Overall	500	93	499	857,741
	AT&T & ILEC	37	8	37	71,581
	AT&T & Non-ILEC	13	1	13	20,601
	Non-AT&T & ILEC	171	28	171	322,238
	Non-AT&T & Non-ILEC	279	56	279	443,321

Survey Response

The table below shows the number of responses, the number of different service providers, and the number of different Census tracts within each stratum for survey responses requested, received, and received indicating service was provided.[11]

Stratum	Survey Status	Responses	Service Providers	Census Tracts
AT&T & ILEC	Requested	37	8	37
	Received	37	8	37
	Service Provided	37	8	37
AT&T & Non-ILEC	Requested	6	1	6
	Received	6	1	6
	Service Provided	6	1	6
Non-AT&T & ILEC	Requested	171	28	171
	Received	171	28	171
	Service Provided	171	28	171
Non-AT&T & Non-ILEC	Requested	214	49	214
	Received	173	46	173
	Service Provided	173	46	173
All	Requested	428	86	427
	Received	387	83	386
	Service Provided	387	83	386

Each response stating that service was provided indicated whether each of the following service types was offered:

- Unlimited or Flat-Rate Local Service
- Unlimited All-Distance Service

[11] Responses that indicated residential service was provided but later found to be business only or bundled only are excluded from this count.

- Measured or Messaged Local Voice Service

The table below provides the number of responses with rates for each service type in each stratum.

Service Type	AT&T & ILEC	AT&T & Non-ILEC	Non-AT&T & ILEC	Non-AT&T & Non-ILEC
Unlimited or Flat-Rate Local Service	78	7	201	129
Unlimited All-Distance Service	92	7	100	181
Measured or Messaged Local Voice Service	92	0	128	2

Monthly Rates and Rate Spreads

The rate spread (the maximum rate less the minimum rate) is an additional component of the calculation of the standard deviation of monthly rates. For each (service provider, Census tract) pair, separate monthly rates were calculated for each of the two service technologies (circuit and interconnected VoIP (iVoIP)). The following average monthly rates were calculated:

- Average RSC[12] = (Minimum RSC + Maximum RSC)/2
- Average StSLC[13] = (Minimum StSLC + Maximum StSLC)/2
- Average StUSF[14] = (Minimum StUSF + Maximum StUSF)/2
- Average ManEAS[15] = (Minimum ManEAS + Maximum ManEAS)/2
- Average FSLC[16] = (Minimum FSLC + Maximum FSLC)/2

If the service provider indicated that multiple rates were not offered in the Census tract, then the average monthly rates above were set equal to the minimum[17] monthly rate provided in the response.

For the reasonable comparability benchmark (CB), the following average monthly rate was used if the service provider offered multiple rates in the Census tract:

- Minimum Rate CB = Minimum Rate + Minimum FSLC[18]
- Maximum Rate CB = Maximum Rate + Maximum FSLC
- Average Rate CB = (Minimum Rate CB + Maximum Rate CB)/2

[12] Recurring Service Charge is abbreviated as RSC.

[13] State Subscriber Line Charge is abbreviated as StSLC.

[14] State USF is abbreviated as StUSF.

[15] Mandatory Extended Area Service is abbreviated as ManEAS.

[16] Federal Subscriber Line Charge is abbreviated as FSLC.

[17] The term "minimum" is used for consistency with the naming convention in the survey data. For Census tracts where the service provider indicated that multiple rates were not offered (i.e., only a single rate was submitted), the rates are recorded in the survey dataset as the "minimum" value.

[18] Federal Subscriber Line Charge is abbreviated as FSLC.

- Rate Spread CB = Maximum Rate CB - Minimum Rate CB

The following average monthly rate was used if the service provider did not offer multiple rates in the Census tract:

- Average Rate CB = Minimum Rate + Minimum FSLC
- Rate Spread CB = 0

Weights

Weights are required to ensure the contributions of each response properly represent the offers that consumers possibly receive nationwide. Weights are also used to ensure that a service provider's rates do not exert extra influence on the estimate only because the provider offers service using two technologies instead of one.

The 2022 voice URS weight calculation method is the same as what had been used in past survey cycles. Each rate was assigned a weight according to the following equation:

Weight = Sampling Weight x Nonresponse Weight x Rate Weight x Number of Potential Subscribers

Sampling Weight is the inverse of the selection probability for each sample unit. The selection probability is determined by the total number of units in each stratum, the sample size in each stratum, and the units' number of potential subscribers described in the sample selection section earlier. Each sample is assigned a sampling weight to reflect its selection probability.

Nonresponse Weight is assigned to each stratum to compensate for unit nonresponse in each stratum. It is the total number of potential subscribers sampled over the total number of potential subscribers in the sampled Census tracts of a given provider who has provided rate responses in each stratum.

Rate Weight is assigned to average the rates for iVoIP and circuit when both are employed by the service provider in a Census tract for that service. A service provider that offers a service via iVoIP and circuit technologies is given a weight of ½ for its rates for each service. Otherwise, the rates have a weight of 1.

Number of Potential Subscribers is the estimated number of potential customers to whom the providers advertise their service.

The final weight is the product of Sampling Weight, Nonresponse Weight, Rate Weight, and the Number of Potential Subscribers from a provider in a given tract.

Rate Estimates for Unlimited or Flat-Rate Local Service

The average rate is estimated as the following:

$$\text{Estimated average rate} = \frac{\sum_{i=1}^{N} w_i Rate_i}{\sum_{i=1}^{N} w_i}, \text{ N = total number of rate responses}$$

Estimates of the average rate and the standard deviation of rates were calculated separately for each stratum and for the strata combined. The estimated average rate was the weighted average of rates for the stratum or combined strata. The estimated standard deviation of rates is calculated as follows:

$$\text{Estimated standard deviation} = \sqrt{\frac{\sum_{i=1}^{N} w_i(Rate_i - Estimated\ average\ rate)^2}{\sum_{i=1}^{N} w_i - 1}}$$

The table below presents the rate estimates for each stratum separately and combined.

Service Providers	Without FSLC		With FSLC	
	Average	Standard Deviation	Average	Standard Deviation
ILEC	$30.39	$6.34	$36.18	$6.31
Non-ILEC	$27.00	$11.20	$32.15	$12.79
All	$29.44	$8.14	$35.05	$8.80

Reasonable Comparability Benchmark

The reasonable comparability benchmark was calculated by taking two standard deviations above the average urban rate for all local flat-rate providers, with SLCs included in the rates.

Service Type	Responses with Rates	Service Providers	Census Tracts	Average Rate	Two Std Devs above the Average Rate
Unlimited or Flat-Rate Local Service	317	72	316	$35.05	$52.65

The reasonable comparability benchmark for voice service is based on the average monthly rate plus two standard deviations (including FSLC) for unlimited or flat-rate local service offered by ILECs and Non-ILECs. [19] This value is $52.65.

[19] *See Connect America Fund et al*., WC Docket No. 10-90 et al., Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663, 17694, para. 84 (2011), aff'd sub nom In re FCC 11-161, 753 F.3d 1015 (10th Cir. 2014).

APPENDIX A

Provider Presence Ratio Model Coefficients

		Estimate	Std. Error
b0	(Intercept)	2.371	1.952
b1	logpsubscrbr	0.716	0.032
r1	OpTypnILEC	- 0.469	0.008
r2	StFips02	1.245	0.103
r3	StFips04	0.499	0.038
r4	StFips05	- 0.097	0.054
r5	StFips06	0.649	0.033
r6	StFips08	0.602	0.041
r7	StFips09	0.877	0.045
r8	StFips10	0.238	0.071
r9	StFips11	0.838	0.068
r10	StFips12	0.255	0.034
r11	StFips13	- 0.067	0.039
r12	StFips15	0.588	0.067
r13	StFips16	0.232	0.058
r14	StFips17	0.593	0.035
r15	StFips18	0.267	0.040
r16	StFips19	0.271	0.049
r17	StFips20	0.384	0.048
r18	StFips21	0.847	0.049
r19	StFips22	0.036	0.044
r20	StFips23	- 0.147	0.066
r21	StFips24	0.147	0.040
r22	StFips25	0.629	0.039
r23	StFips26	0.515	0.036
r24	StFips27	0.484	0.041
r25	StFips28	- 0.088	0.065
r26	StFips29	0.617	0.041
r27	StFips30	0.012	0.088
r28	StFips31	0.823	0.059
r29	StFips32	0.150	0.045
r30	StFips33	0.152	0.077
r31	StFips34	0.539	0.038
r32	StFips35	0.838	0.055
r33	StFips36	1.081	0.035
r34	StFips37	0.259	0.039
r35	StFips38	- 0.145	0.096

r36	StFips39	0.704	0.036
r37	StFips40	0.386	0.036
r38	StFips41	0.339	0.045
r39	StFips42	0.392	0.036
r40	StFips44	0.505	0.070
r41	StFips45	- 0.108	0.044
r42	StFips46	0.134	0.093
r43	StFips47	0.125	0.041
r44	StFips48	0.464	0.034
r45	StFips49	0.702	0.045
r46	StFips50	0.285	0.039
r47	StFips51	0.201	0.039
r48	StFips53	0.498	0.039
r49	StFips54	0.273	0.061
r50	StFips55	0.608	0.042
r51	StFips56	0.999	0.117
r52	StFips72	1.952	0.039