

E-rate Funding and Libraries: Preliminary Analysis of Trends Post-Modernization

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Abstract. Libraries in the United States have access to discounts on internet and telecommunications services through the Federal Communications Commission’s (FCC) Schools and Libraries Program, also known as E-rate. While the academic literature on E-rate funding is sparse, especially when it comes to analysis of library participation, it does indicate that libraries have benefited from the program. Since 2016, E-rate data has been provided openly by the Universal Services Administrative Company. We use the available data to answer questions about funding commitments to libraries including total commitments, commitments per applicant type and geographical coding, and number of unique entities. We also discuss potential future research questions related to the data, both alone and in conjunction with other available open data.

Keywords: Public Libraries · Open Data · E-rate

1 Introduction

Libraries in the United States have access to discounts on internet and telecommunications services and related equipment through the Schools and Libraries Program, commonly known as E-rate. E-rate is a Federal Communications Commission (FCC) program designed to implement the universal service principle, “that all Americans should have access to communications services” [1]. E-rate arose out of the 1996 Telecommunications Act that expanded upon the telephone-centered telecommunications definition of universal service to include more advanced services such as high-speed internet. Universal service programs are funded by revenue from telecommunications service providers.

To receive discounts, eligible school and library organizations submit an application either individually or as part of consortia to the Universal Services Administrative Company (USAC), which administers the E-rate program. Requests for funding can be made within two different service categories: Category One services include “telecommunications, telecommunications services, and Internet access,” and Category Two services include “internal connections, basic maintenance of internal connections, and managed internal broadband services” [2]. Discount amounts are determined by the percentage of students eligible for free or reduced meals via the National School Lunch Program within the school district in which a library is located. Eligibility for the National School Lunch

Program is based upon household income and family size [3]. An additional criteria for discount percentage calculation is whether the location is urban or rural [4]. Rural locations receive higher discounts. Discounts for services range from 20-90% [5].

In May 2010, the Federal Communications Commission (FCC) began a period of review to modernize the E-rate program [6]. This review led to a series of FCC orders in 2014 that codified changes to the program and set goals for the program’s future. The three goals for the program were 1. ensure affordable access to broadband sufficient for “robust connectivity for all libraries”; 2. maximize cost-effectiveness for E-rate spending; and 3. make the application process “fast, simple, and efficient” [7]. To achieve these goals, the Commission re-allocated funding from legacy services (e.g. voice or paging) to focus on increasing the adoption of high-speed internet access and related infrastructure within school or library buildings; improving processes to ensure effective program expenditures by participants; and providing additional flexibility in the use of funding within the administration of the program. The practical impact of the modernization orders is that more funding is available to participants for sustaining broadband services covered under Category One while also ensuring adequate funding is available to meet the expected demand for Category Two funding requests. In addition to supporting more services, the 2014 modernization effort substantially increased the overall funding for E-rate to \$3.9 billion USD and added yearly inflation increases [7]. Current funding for 2020 stands at \$4.15 billion USD.

Research into participation and utilization of E-rate funds in public libraries in the pre-modernization period was hampered by the lack of openly available application data. A secondary goal of the modernization effort was to provide greater access to program data. To that end, USAC provides application and decision data from 2016 to the present on a Socrata open data platform with download and API options for retrieving data, allowing anyone to analyze the data and gain insights into how libraries are utilizing E-rate.

2 Research Questions

We began analysis of E-rate data specific to libraries¹ to fill the gap in research within the field. Our research will add novel and actionable knowledge to practitioners, advocates, policymakers, and other researchers in the library field. In this paper, we begin the analysis by answering four research questions about the 2016-2020 funding data:

1. What are the total funding commitments to library entities by category of service annually?

¹ When we refer to libraries in this paper, we are referring to any of the following entities that are associated with libraries: individual libraries, library systems, non-instructional facilities (NIFs).

2. How many unique library entities are receiving commitments annually and are those entities represented in the 2018 Institute for Museum and Library Services Public Library Survey dataset?
3. What are the funding commitments by organization type annually?
4. What are the funding commitments to recipients by their geographical coding annually?

We chose these initial questions to provide baseline data on library entities participating in E-rate. The datasets available are large and cumbersome so we began with simple exploratory questions from which to build upon and inform further analysis. The focus on library participation during the post-modernization period is a valuable input to programmatic and policy discussions at the state and national level that has so far been lacking. E-rate provides discounts for services that many libraries are already paying for and participation data can help prioritize issues around incentivizing participation, upgrading technology and connectivity, and effective application procedures and coordination.

3 Literature

The academic literature on E-Rate funding is sparse, especially when it comes to analysis of library usage. Jaeger, McClure, and Bertot [8] analyzed E-rate data for libraries from 2000-2004, finding that dollar amounts of discounts were not associated directly with population counts and that the top five states receiving the most library funding had varying library funding per capita. The researchers noted that libraries received significant benefit from E-rate funding but that much more analysis and research was needed. There is a dearth of research into E-rate post-modernization but a recent case study highlighted usage of E-rate funds by tribal library and school consortia to build fiber optic networks in New Mexico [11].

Analysis of E-rate usage by schools is more common than libraries and indicates that before the 2014 modernization effort E-rate funding was positively correlated with the percentage of minority students in a school [15] [14] and state population count [10]. Sarah Oh used ordinary least squares (OLS) regression to predict outcomes of applications, finding that high discount-rate recipients may more likely be from cities rather than rural, town, or suburban locations [9], however Park and Jayakar [14] [15] and Panagopoulos [10] did not find this to be the case. A post-modernization study looked at whether modernization had an impact on funds distribution in Pennsylvania and whether disadvantaged school districts were more successful in obtaining funding. In the year following the 2014 reform they found no significant departure from long-term trends and concluded that at that time, reform had not significantly changed funding outcomes in Pennsylvania [13].

The relative lack of analysis related to library usage combined with the open availability of application data from 2016 forward, prompted this initial study identifying baseline trends for commitments made to libraries during the post-modernization period from 2016 to 2020.

4 Analysis

4.1 Data

The Universal Service Administrative Company provides 2016-2020 E-rate data openly using a Socrata platform [16]. This allows access to the data via the Socrata API. There are fifteen different datasets available relating to E-rate. Our initial analysis focuses on the “E-rate Recipient Details And Commitments” [17] dataset (which we refer to as the “commitments dataset”) providing information on commitments made to entities.

4.2 Method

The full commitments dataset contains over 8 million rows and 69 variables [17]. To trim this to a more manageable size, we created an R [19] script that loops through each year, pulling data and filtering to eliminate any recipients or billed entities that are clearly public schools or public school systems. We also calculate the estimated committed dollars at the recipient level, as the original data only includes totals committed at the organization level. The R script is set up on a schedule on an Amazon Web Service (AWS) virtual machine to run multiple times per week and output datasets specific to our analysis needs to an AWS S3 storage bucket. We can then retrieve a much smaller dataset using the R `aws.s3` package [22] as needed from our S3 bucket.

Additionally, we want to use the open data available in the Institute for Museum and Libraries Services (IMLS) Public Library Survey (PLS) [12] to further understand the libraries that are or are not participating in the E-rate program. The PLS is the most comprehensive dataset focused on public libraries in the United States. In order to join the E-rate data with the IMLS PLS data, we need a key variable. Neither the E-rate nor the IMLS data contain this key, so we have matched the datasets using 1. geospatial matching on latitude and longitude variables using the R `fuzzy_join` package [21] 2. string matching on library name variables using the R `stringdist` package [20] and 3. comparing the two datasets and entering key variables by hand.

Because the data changes on a daily basis, we have also created an R Shiny [23] dashboard viewable at: https://uwtascha.shinyapps.io/eRate_dashboard/ to showcase our analysis with more timely data. This allows stakeholders to follow our progress in real time.

5 Results

E-rate funding years begin on July 1st of the stated year and end the following June 30th. While funding years 2016-2019 are complete it is important to note that appeals of USAC decisions and audits can lead to changes in commitment data for any year. Funding commitment data are updated daily on the USAC site and variations between what is shown on the site and totals published here

are certain to occur. As of this writing, funding year 2020 is still in progress so we will not compare 2020 totals with previous years.

Our first research question is designed to get an overview of library E-rate funding commitments (Table 1). By filtering the dataset to include only library entities (including libraries, library systems, and non-instructional facilities associated with libraries) we are able to provide funding data not previously published. In order to put these commitments in the greater context of E-rate commitments, we've also gathered full funding commitment data from the USAC Search Commitments Tool (Table 2) [25].

Table 1 shows that the largest funding commitment total to libraries was made in 2016 with a sharp decrease the following year. However, total funding commitments have steadily increased from 2017 through 2019 (though not yet reaching the 2016 level). Using the commitments totals from Table 2, we calculate that library funding has accounted for between 4.9% - 5.5% of overall E-rate funding between 2016-2019.

Funding Year	Category 1 Commitment	Category 2 Commitment	Total
2016	\$117,812,408.01	\$18,401,680.48	\$136,214,088.49
2017	\$104,181,982.06	\$14,461,625.76	\$118,643,607.82
2018	\$112,838,065.47	\$10,057,081.32	\$122,895,146.78
2019	\$111,067,231.72	\$18,601,606.83	\$129,668,838.55
2020	\$105,003,537.72	\$19,427,911.79	\$124,431,449.51

Table 1. E-rate commitments to libraries as of January 5, 2021.

Funding Year	Total E-rate Funding
2016	\$2,775,317,971.71
2017	\$2,370,253,412.07
2018	\$2,294,825,106.54
2019	\$2,358,590,202.61
2020	\$2,075,155,660.73

Table 2. E-rate commitments totals (both schools and libraries) as of January 5, 2021. Amounts retrieved from USAC's Search Commitments Tool [25].

Research question two seeks to understand how many unique library entities are in the dataset and whether they are represented in the 2018 IMLS PLS dataset [12]. The counts of unique library entities in the E-rate Commitments data displayed in Table 3 and the counts of library entities matched to IMLS Administrative Entities and IMLS Outlets displayed in Table 4 both show a decreasing rate of participation over time. Additionally, the number of IMLS

entities is less than the overall number of library entities, indicating that library entities from outside the IMLS dataset apply for and receive funding commitments. Future analysis will focus on the participation rate of IMLS administrative entities and outlets.

Funding Year	Number of Libraries
2016	11,853
2017	11,684
2018	11,396
2019	11,221
2020	10,965

Table 3. Number of unique library entities applying per year as of January 5, 2021.

Funding Year	Number of Libraries
2016	10,917
2017	10,781
2018	10,515
2019	10,346
2020	10,142

Table 4. Number of unique library entities matched in the IMLS PLS dataset applying per year as of January 5, 2021.

Our third research question asks how library funding differs based on the application type. Figure 1 shows that per library entity, those applying as part of a library system received on average the highest funding commitment each year, with consortia coming in a close second. Consortia can include libraries, schools, or a combination of both. Libraries applying individually received the lowest average funding commitment. This could indicate a potential advantage for libraries to connect with either a system or consortium when submitting an E-rate application.

Finally, as mentioned earlier, the geographical coding (urban or rural) of a library is one factor in the E-rate discount calculation. Thus it is useful to understand how funding is distributed across the locales. Table 5 shows that a small percentage of library entities are not classified into locales. According to E-rate Applicant documentation, there are limited instances in which a designation is not required, such as some Consortia, statewide applications, or non-instructional facilities [4] which likely accounts for those undesignated entities. Figure 2 and Table 5 show that on average, year over year, urban libraries have received more funding than rural libraries. Further analysis of the

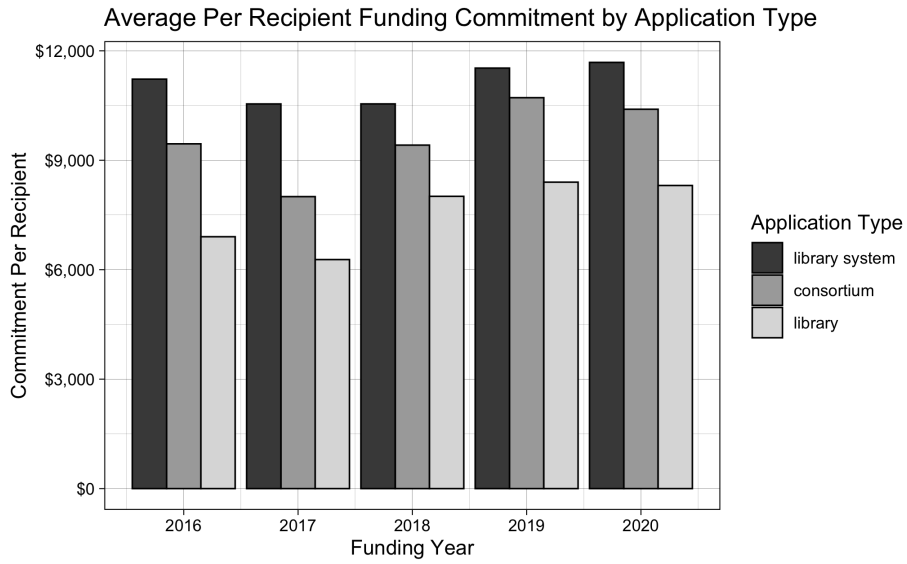


Fig. 1. Per recipient funding averages by application type as of January 5, 2021.

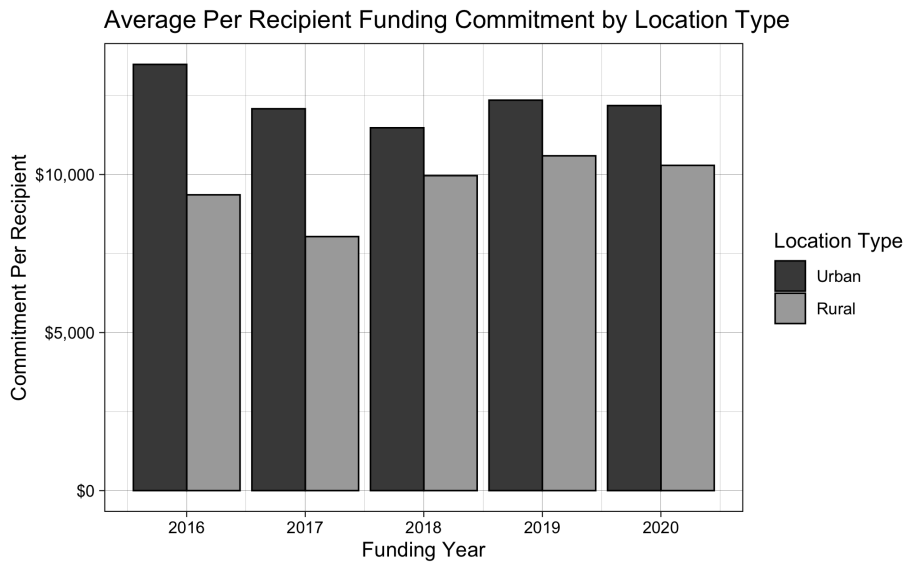


Fig. 2. Per library funding averages by location as of January 5, 2021. Undesignated locations removed for graphic (see Table 5 for totals).

Funding Year	Location Type	Total Commitment	Total Entities	Average Per Entity Commitment
2016	Urban	\$80,392,991	5,962	\$13,484
	Rural	\$54,229,252	5,795	\$9,358
	Not Designated	\$1,591,845	101	\$15,761
2017	Urban	\$71,578,872	5,925	\$12,081
	Rural	\$45,382,264	5,647	\$8,037
	Not Designated	\$1,682,472	113	\$14,889
2018	Urban	\$66,704,253	5,811	\$11,479
	Rural	\$54,473,831	5,467	\$9,964
	Not Designated	\$1,717,063	118	\$14,551
2019	Urban	\$70,966,857	5,745	\$12,353
	Rural	\$56,700,614	5,353	\$10,592
	Not Designated	\$2,001,368	123	\$16,271
2020	Urban	\$70,239,930	5,766	\$12,182
	Rural	\$52,166,564	5,070	\$10,289
	Not Designated	\$2,024,956	129	\$15,697

Table 5. E-rate commitments to recipients by their urban or rural status as of January 5, 2021.

types of services requested can provide additional insight into the differences in commitments received and inform potential interventions to increase funding for rural libraries.

6 Discussion

This preliminary analysis establishes a baseline of statistics about libraries applying to the E-rate program. We found that cumulative funding decreased from 2016-2017 but then rose each year following. Despite the increases in cumulative commitments, the number of library entities applying for E-rate has declined each year. This could indicate a need for interventions or promotion of the program. Library entities applying as part of a library system average higher per recipient funding commitments than those applying as part of consortia or individually, and average funding commitments are higher to urban designated entities. Questions arising from our findings include: why was 2016 the highest funded year for libraries to date?; why is library participation decreasing?; what percentage of libraries in the IMLS PLS dataset participate in E-rate?; and what specific services are requested by rural versus urban libraries?

We are also interested in continuing our research into funding trends post-modernization. Additional areas of interest include:

- Modernization program goals: The modernization process had specific goals for connectivity levels for libraries and also broader program goals for efficiencies. Data analysis could explore whether certain libraries or organizations

- are benefiting more from E-rate, whether public libraries are increasing their bandwidth, and whether they have done so at lower costs over time.
- Additional trend data: Our initial analysis has focused on commitments, but we also want to analyze disbursements data and compare it with commitments data. If disbursements aren't matching commitments, this could indicate potential problems in the funding process.
 - Links to other data: Now that we have matched USAC and IMLS PLS data, we want to further explore library characteristics, such as locale, organizational structure, funding and staffing levels, and technology services to understand potential relationships to participation, utilization, and impacts of the E-rate program.
 - Non-participants: Most, but not all, public libraries participate in the E-rate program currently. Additional qualitative data outside of the open datasets provided by USAC and IMLS is needed to understand the barriers to participation[24] in the E-rate program to ensure that its benefits are as widespread as possible.

7 Conclusion

In this paper we present our method for gathering E-rate data and preliminary results from the analysis as it pertains to libraries in the United States. Our analysis sets a baseline understanding of E-rate participation by libraries from which to build upon and share with stakeholders. Results from this research will assist public library administrators and state library agency staff, as well as policymakers at the state and federal levels in understanding library usage of the program and changes in usage over time.

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