Redefining the Digital Divide: The Impact of Changes in Rural Definitions for E-Rate Discount Eligibility

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Abstract: The Federal Communications Commission (FCC) administers the E-Rate program to provide discounts to schools (and libraries) for purchases of telecommunications equipment and services. The E-Rate program attempts to reduce the digital divide by providing larger discounts to schools in rural areas, and to schools with a large percentage of students who qualify for free and reduced-price lunches. The FCC recently made significant revisions to the criteria used for E-Rate urban-rural classifications, and these revisions are likely to impact discount rates for many school districts throughout the U.S. We examine the effects of these revisions using GIS to compare the old and new program criteria with school and district-level spatial data from the U.S. Department of Education's National Center for Education Statistics (NCES). This poster reviews the program's geographic criteria, explains our methods for comparing and analyzing the changes, and discusses the impact and implications of the new classifications for states and program participants.

Background: The E-Rate program was authorized by Congress as part of the Telecommunications Act of 1996 to help schools and libraries acquire telecommunications equipment and services needed to serve their students and communities. Eligible institutions receive discounts ranging from 20 percent to 90 percent of the price of eligible services based on the location of the institution and the poverty level of the community it serves. Schools and libraries in rural areas or with high poverty levels receive larger discounts than institutions located in urban areas or with lower levels of poverty. The program was initially funded at $2.25 billion, but was indexed to inflation beginning in 2010. The funding cap in 2013 was $2.4 billion. In 2014 the FCC initiated an effort to modernize the E-Rate program and issued new rules that introduced significant changes for program participants. In addition to increasing the program funding from $2.4 billion to $3.9 billion, the FCC also revised the geographic definitions for urban and rural assignments.

Original Geographic Framework: E-Rate's original method for assigning urban/rural status was based on a county-level approach used at the time by the U.S. Department of Health and Human Services' Office of Rural Health Care Policy (ORHP). ORHP classified all counties outside Metropolitan Statistical Areas (MSAs) as rural, with additional modifications (known as Goldsmith modifications) to account for primarily rural census tracts and minor civil divisions located in large metropolitan areas. These definitions were originally operationalized with 1990 census data. Shortly after E-Rate was implemented, ORHP discontinued its use of the modified county-based classifications in favor of a more nuanced framework based on census tracts, and it chose not to update its old framework with 2000 census data. As a result, the geographic framework adopted by E-Rate was not supported, and the data used to operationalize urban/rural assignments after 1997 could not be fully updated in the manner originally anticipated by program officials. The program updated the geographic data used for its assignments in 2003, but could not fully implement the modifications to rural portions of urban counties that were included in the original framework. Therefore, the updated data continued to include some 1990 census tracts that were no longer recognized for the 2000 census.

Limitations of the Original Framework: E-Rate's original geographic classifications were hamstrung by three key limitations. First, the unit of geography used for most classifications was too large to effectively represent communities served by individual schools and libraries. The Goldsmith modifications provided improvement, but the resulting framework remained too general and failed to account for important variations within counties. Second, E-Rate's geographic framework was difficult to update and replicate. Although it primarily relied on basic units like counties, the additional intra-county modifications for metropolitan areas were difficult for program administrators to implement directly. Third, the original classifications conflicted with other commonly used urban/rural definitions applied by other federal agencies. Although E-Rate depended on census data to operationalize its geographic assignments, the program chose not to use the Census Bureau's definitions of urban and rural that had been available and shared by other federal agencies since the 1950s.

New Geographic Framework: In 2014 the FCC initiated an effort to review and revise various parts of the program, including the definitions for urban and rural areas. The final E-Rate modernization plan implemented significant changes by adopting a variation of the Census Bureau's standard urban area concept. E-Rate's new methodology defines urban territory as all Census Urbanized Areas, as well as Urban Clusters with a population greater than 25,000. Urbanized Areas are large urban cores with a population of 50,000 or more, and Urban Clusters are small urban cores with a population less than 50,000 but greater than 2500. About 92% of all Urban Clusters have a population less than 25,000. Equally important, the new methodology shifted eligibility from the individual school level to the school district level. This streamlined the application process and provided greater flexibility for applications. Although school districts may operate schools located in both urban and rural areas, the school district is classified based on the majority classification. If most schools in a district are rural, then the district is classified as rural, and all schools in the district are treated as rural for discount purposes, regardless of actual location.

Research Questions: E-Rate is an important and widely used educational program, and the change to its urban/rural classifications could significantly affect many schools across the U.S. The purpose of this study was to examine the basic impact these changes had on the universe of public schools and school districts. More specifically, we asked:

— Since the old E-Rate geographic definitions primarily classified counties as entirely urban or rural (and therefore failed to fully account for urban territory in rural counties and rural territory in urban counties), and the new definitions rely on more nuanced urban area geographies that were constructed from census blocks, does the new E-Rate geographic framework cause a substantial shift in the overall proportion of urban and rural schools?

— How do the changes to E-Rate geographic definitions impact the proportion of urban and rural schools in each state? Do these changes affect all states equally, or does the proportion change more in some states than others?

— The old program rules determined discounts based on the geographic location of individual schools, rather than school districts. Therefore school district classifications have not changed per se. However, if school district majorities were determined based on schools classified by the old geographic criteria, how would they have changed?

Methods and Data: The E-Rate program previously relied on program applicants to determine urban/rural status by comparing their school or library location with a list of rural counties (and sub-county areas) provided on the E-Rate program website. The program did not create or publish spatial data showing urban and rural areas; therefore, the only way to compare school assignments and systematically examine the impact of the new definitions was to first create spatial data of urban/rural areas based on the old definitions. We used ArcGIS to link the list of rural counties/tracts/minor civil divisions provided on the FCC's web site (http://www.usac.org/si/applicants/step04/urban-rural.aspx) with 2010 TIGER/Line shapefiles for counties, tracts, and minor civil divisions (with help from the Census Bureau's Census Tract Relationship Files) to create a working layer of old urban/rural boundaries. Given the lack of authoritative spatial data from the program, this was our best approximation of the geography used for program assignments, though we are aware that many tracts (and some counties) have changed boundaries or IDs since the E-Rate program first began making geographic assignments. Fortunately, E-Rate's new urban/rural definitions largely rely on standard Census urban areas. Therefore, we created a new layer by joining 2014 TIGER/Line urban area boundaries with urban area population counts from the 2010 census, and dropping all Urban Clusters with a population less than 25,000. Once the old and new urban/rural boundaries were prepared, we created a shapefile of point locations for all public schools in the U.S. based on data available from the National Center for Education Statistics' (NCES) 2013-2014 Common Core of Data (CCD) school file. Each school included a unique school district identifier that facilitated our district-level analysis. We then joined the school points to the old and new urban/rural shapefiles to produce old and new classifications for each school. Once the final school file was prepared, we used SAS, ArcGIS, and Excel to create district-level majority assignments, and then to compare, review, and summarize results for schools, states, and districts.

Results—Differences in Geographic Coverage: The most visible difference at a national scale between the old and new classifications is the granularity of the new urban areas relative to the old urban areas. All territory in Figure 1 not defined as old urban is classified as old rural. Likewise, all territory not defined as new urban is classified as new rural. The old urban areas were primarily based on Metropolitan Areas defined by county boundaries, whereas the new areas are based on Urbanized Areas and Urban Clusters that were constructed from census blocks. The territory inside old urban areas but outside new urban boundaries is the area most impacted by the E-Rate program changes (see Figure 1). However, all areas are equally affected by E-Rate's new decision to adopt district majority assignments in place of individual school assignments.

Results—State Variation: Although the majority of public school students attend schools in urban areas, most states include a substantial portion of rural schools (see Table 1). Under E-Rate's original county-level framework, states with high concentrations of rural schools were primarily located in the upper great plains (MT, WY, ND, SD) and in the central midwest (IA, NE, KS, OK). Relatively high concentrations could also be found in the southern and mid-Atlantic states, particularly AR, MS, KY, and WV, as well as northern New England in VT, NH, and ME (see Figure 2). Most of these states continue to have high concentrations of rural schools under the new E-Rate definition, but many others—particularly in the mid-Atlantic and southern states—experience sizable increases in their concentration of rural schools as a result of the change (see Figure 6). Many of these states contain large multi-county metropolitan areas that previously caused extensive territory to be defined as urban under the old criteria. Of those states that increased their concentration of urban schools, Figure 7 shows that some were clustered in the mid-Atlantic, South, and Puerto Rico, but most were located in the great plains (NE, KS), southwest (NM, AZ), Pacific northwest (OR, WA), and the mountain areas (ID, WY, UT). These non-metropolitan areas previously defaulted to rural in their entirety, but the new definitions now recognize the presence of smaller urban cores.

Results—School District Classification: Both the old and new E-Rate criteria classify the majority of U.S. school districts as rural, but the new criteria have a greater bias toward rural classifications. About 80% of all district assignments remained unchanged, while most of the remaining 20% shifted from urban to rural (see Table 2). As expected, these changes primarily occurred inside metropolitan counties where many rural school systems had previously been classified as urban by default. Although the overwhelming majority of reclassified districts shifted from urban to rural based on the new criteria, about 3% of districts were reclassified from rural to urban. These urban shifts occurred in school systems near portions of urbanized areas and urban clusters located in non-metropolitan counties where prior county-level rural assignments masked variations in settlement and land use. Figure 8 provides examples of these types of district-level changes for school districts in Arkansas, Ohio, and North Carolina.

Conclusions: Recent revisions to the FCC's E-Rate program adjusted the urban/rural definitions to adopt a more nuanced delineation of urban areas. The new definition improves the geographic data that are used to determine program discounts, and helps to target program resources more effectively. The revised criteria resulted in a net increase in rural schools for the U.S. as a whole, but individual states were impacted differently. Unlike the prior rules that assessed purchase discounts based on the location of individual schools, the new program determines discounts based on whether a school district operates a majority of urban or rural schools. Therefore, the new geographic changes are mediated through an equally significant new administrative change, and the interaction of the two components may have important and unexpected effects for the program in the years to come.

FIGURE 1. URBAN AND RURAL AREAS OF THE US - OLD AND NEW DEFINITIONS

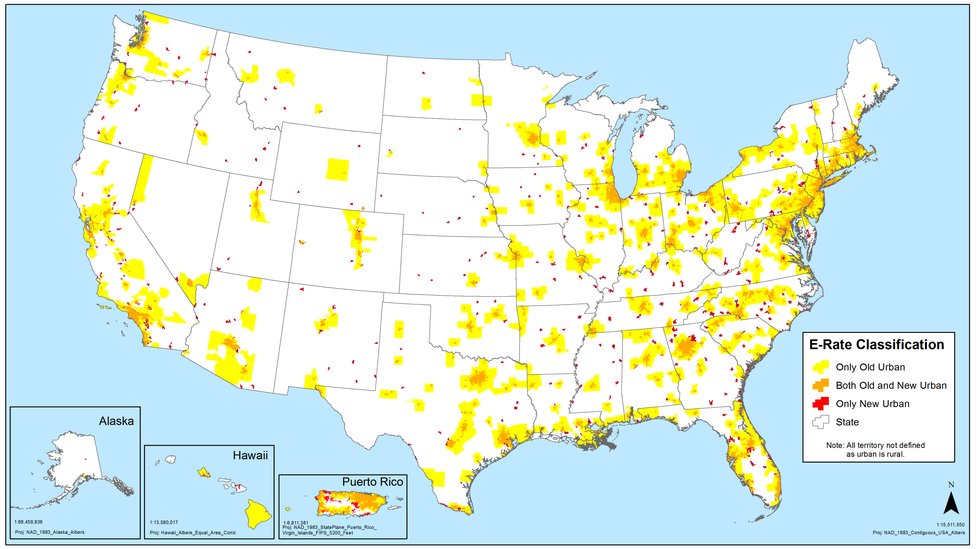

FIGURE 2. US STATES BY PERCENT OF ALL SCHOOLS THAT WERE RURAL

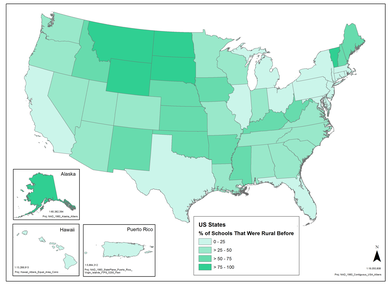

FIGURE 3. US STATES BY PERCENT OF ALL SCHOOLS THAT WERE URBAN

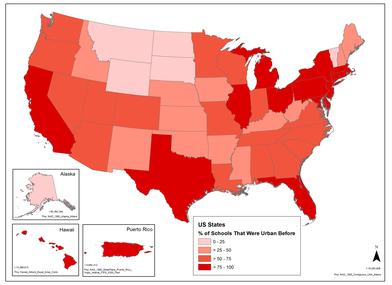

FIGURE 4. US STATES BY PERCENT OF ALL SCHOOLS THAT REMAIN RURAL

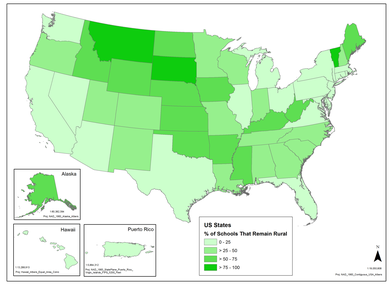

FIGURE 5. US STATES BY PERCENT OF ALL SCHOOLS THAT REMAIN URBAN

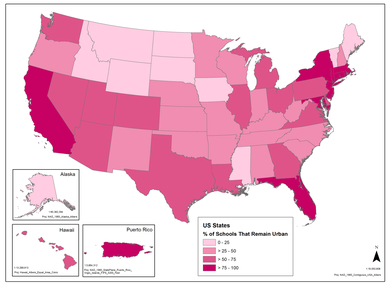

FIGURE 6. US STATES BY PERCENT OF ALL SCHOOLS THAT BECAME RURAL

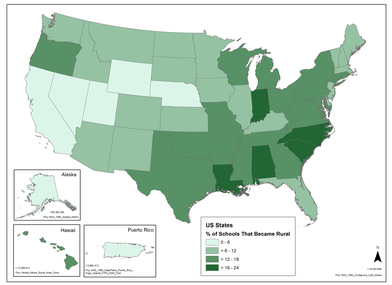

FIGURE 7. US STATES BY PERCENT OF ALL SCHOOLS THAT BECAME URBAN

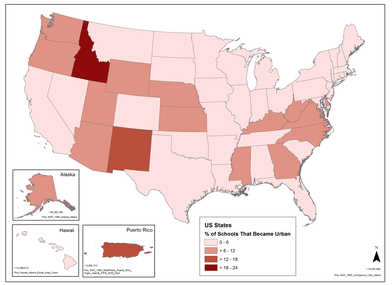

FIGURE 8. E-RATE LOCALE CHANGE BY DISTRICT - THREE STATES

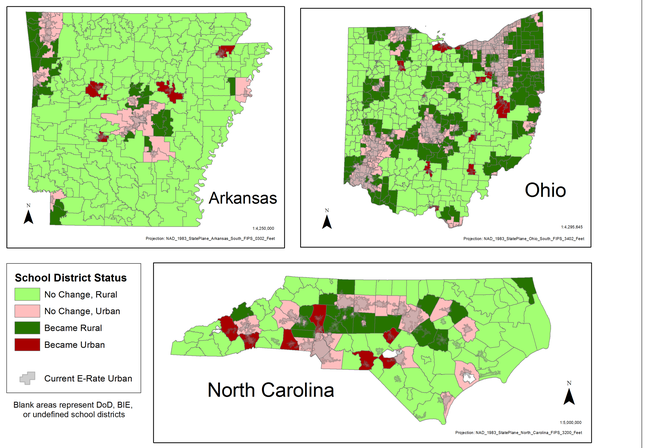

TABLE 1. SCHOOL STATUS BY STATE

State	No Change	No Change	Became	Became
Alabama	35.81	41.68	20.50	2.01
Alaska	69.69	17.76	1.35	11.20
Arizona	20.61	66.41	6.76	6.23
Arkansas	52.00	29.99	12.78	5.24
California	11.67	76.53	5.94	5.87
Colorado	29.35	62.31	6.83	1.51
Connecticut	3.86	82.25	12.09	1.80
Delaware	14.83	67.68	11.03	6.46
DC	0.00	99.60	0.40	0.00
Florida	12.03	77.17	7.22	3.57
Georgia	28.38	52.39	12.68	6.55
Hawaii	12.41	64.83	16.90	5.86
Idaho	51.34	22.28	6.15	20.23
Illinois	21.59	65.00	10.69	2.72
Indiana	28.80	47.31	20.10	3.79
Iowa	61.08	24.42	9.84	4.67
Kansas	53.82	29.04	10.59	6.54
Kentucky	52.80	31.98	7.02	8.19
Louisiana	26.77	50.07	18.78	4.38

State	No Change Rural %	No Change Urban %	Became Rural %	Became Urban %
Maine	68.00	17.12	9.28	5.60
Maryland	6.39	78.16	13.12	2.34
Massachusetts	4.50	86.18	8.69	0.64
Michigan	22.36	59.23	17.28	1.13
Minnesota	37.38	48.95	11.32	2.34
Mississippi	58.38	20.02	12.01	9.59
Missouri	41.71	39.11	16.01	3.18
Montana	79.14	9.18	6.56	5.13
Nebraska	57.94	29.15	5.11	7.80
Nevada	23.77	66.52	5.51	4.20
New Hampshire	46.82	36.35	11.70	5.13
New Jersey	0.00	89.22	10.78	0.00
New Mexico	47.57	33.11	6.67	12.66
New York	9.45	76.14	12.47	1.94
North Carolina	30.32	43.55	19.55	6.58
North Dakota	72.23	18.39	6.00	3.38
Ohio	19.79	60.28	16.36	3.57
Oklahoma	52.43	29.65	14.82	3.10
Oregon	28.87	48.01	13.32	9.81

State	No Change Rural %	No Change Urban %	Became Rural %	Became Urban %
Pennsylvania	14.88	64.09	17.43	3.59
Rhode Island	0.32	87.42	12.26	0.00
South Carolina	27.15	44.11	23.33	5.41
South Dakota	79.77	10.89	6.79	2.55
Tennessee	33.05	47.26	15.13	4.56
Texas	20.31	61.84	15.35	2.51
Utah	26.18	61.12	2.76	9.94
Vermont	80.50	10.69	7.55	1.26
Virginia	23.12	53.07	16.93	6.87
Washington	24.28	59.69	8.84	7.18
West Virginia	50.72	25.89	12.35	11.04
Wisconsin	39.82	44.05	13.08	3.05
Wyoming	71.62	15.95	2.16	10.27
American Samoa	0.00	100.00	0.00	0.00
Guam	100.00	0.00	0.00	0.00
CNMI	100.00	0.00	0.00	0.00
Puerto Rico	7.38	76.37	2.05	14.21
US Virgin Islands	100.00	0.00	0.00	0.00

TABLE 2. E-RATE DISTRICT CLASSIFICATION AND CHANGE

Status	# of Districts	% of Districts
No Change, Rural	6971	52.50
No Change, Urban	3741	28.18
Became Rural	2105	15.85
Became Urban	460	3.46

United States Census Bureau

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