Broadband Availability Mapping

Executive Summary

National, state, and local institutions are actively collecting data about broadband internet availability. Maps displaying broadband availability, adoption, and speed are useful to policymakers, broadband providers, and grantmaking organizations because they help identify areas of need, inform priorities, and direct broadband deployment funds. However, current broadband availability data collection methodologies possess several drawbacks that result in inaccurate and out of date maps. Several state-level efforts provide avenues for policymakers to improve the quality of broadband maps by partnering with communities, consumers, providers, and researchers to collect high-quality data.

Highlights

- Several national broadband availability maps currently exist but they have well-known drawbacks, including overstating broadband coverage. While federal legislation has been passed to address issues with the current broadband maps, several states have undertaken efforts to create their own state-level maps.
- Georgia and Massachusetts have organized comprehensive, household-level broadband data collection projects in collaboration with internet service providers. Other states, including Wisconsin and Iowa, have combined public and private data sources to create maps with several types of information at the census block level. Finally, several other states, including West Virginia, maintain broadband availability maps through the collection of crowdsourced internet speed test data.
- In Missouri, one pilot project demonstrated the feasibility of creating maps of every broadband serviceable structure in three counties. Additionally, the Missouri Broadband Resource Rail currently combines several data sources to generate a statewide broadband availability map.

Limitations

- State-level broadband mapping efforts are not standardized, so there is no single template for creating and maintaining accurate maps.
- Affordability is typically not reflected in broadband availability maps.
- Maps created using self-reported speed test data suffer from data bias issues such as participation rates and home network conditions (e.g., number of devices currently using the internet) at the time of the test.

This science note was prepared by MOST Policy Initiative, Inc. a nonprofit organization aimed to improve the health, sustainability, and economic growth of Missouri communities by providing objective, non-partisan information to Missouri's decisionmakers. For more information, contact Dr. Joshua Mueller, Health & Mental Health Fellow – josh@mostpolicyinitiative.org. This was prepared 8/6/21.

Research Background

National broadband mapping resources and challenges

The Telecommunications Act of 1996 requires the Federal Communications Commission (FCC) to make an annual determination about whether broadband is being deployed to all Americans in a timely manner. To make this assessment, the FCC is responsible for generating a comprehensive map that displays the geographic availability of internet service, along with information such as number of providers and download/upload speeds. The FCC uses this broadband map to direct funds to assist deployment of broadband in areas that are unserved (no availability) or underserved (internet service is available, but not reliably at high enough speeds to qualify as broadband).[1,2]

To generate mapping data, the FCC collects information directly from internet service providers every six months using the Form 477 Data Program. This program collects "data regarding broadband services, local telephone service competition, and mobile telephone services on a single form and in a standardized manner." The FCC collects data on both fixed and mobile broadband availability, but it does not combine the two sets of data into a single map. Instead, it uses the fixed broadband data to create the Fixed Deployment Broadband Map. It separately maintains a Mobile LTE Coverage Map.

To generate this map, all fixed broadband providers must submit a list of all census blocks where they either currently or could provide service to at least one location. Since this submission does not differentiate between locations where the provider is already providing service and locations where they could feasibly provide service, the resulting map will necessarily overstate the current level of broadband adoption. Providers must also specify the last-mile technology used to deliver service, the type of service they offer (e.g., consumer, mass market, or residential), the maximum advertised download and upload speeds for consumer service, and whether service is also available for business, enterprise, or government customers.[1,2]

There are several well-known issues with Form 477 data collection that render the Fixed Deployment Broadband Map incomplete or inaccurate. First, the current methodology uses census blocks as the unit of service, preventing analysis at higher levels of spatial resolution (e.g., individual addresses or structures). Compounding this issue, the FCC considers a census block served if at least one home or business in that census block has (or could access) broadband. As a result, maps generated from Form 477 data overstate broadband availability. In addition, the data is self-reported by broadband service providers, so validation that the information provided is accurate is not currently guaranteed. There is also no process currently in place for consumers or other groups to register a challenge if they believe broadband availability is overstated in their area. Finally, the FCC map does not currently reflect affordability, which is a major barrier to broadband access.[1,2]

In addition to the FCC, Congress also funds the National Telecommunications and Information Administration (NTIA) to develop a National Broadband Availability Map (NBAM), which complements the Fixed Deployment Broadband Map. The NBAM is a geographic information system (GIS) platform which integrates data from the FCC, U.S. Census Bureau, Universal Service Administrative Company, USDA, state governments, and commercial datasets from Ookla, Measurement Lab, BroadbandNow, and White Star. Though each data set on its own may be incomplete, this combination of data sets can enable NBAM users to identify areas where the FCC map may be overstating coverage. As of May 11, 2021, the NBAM covers 36 states, including Missouri, using data from June 2020.

Additionally, BroadbandNow, a private research organization, also uses data from the FCC, U.S. Census Bureau, and providers to generate a National Broadband Map, but it is unclear what data they have from providers in Missouri. Finally, Microsoft maintains a national broadband map based on actual internet use data, which provides another basis for comparison to FCC availability data.

Alternatives to federal maps: State-level case studies

Address-level mapping

In 2018, the Georgia legislature passed the Achieving Connectivity Everywhere (ACE) Act, which tasked the Georgia Broadband Deployment Initiative with mapping broadband availability in the state. The inter-agency team carrying out this project was composed of the Department of Community Affairs (DCA), Georgia Technology Authority (GTA), Department of Economic Development (DEcD), State Properties Commission (SPC), and Georgia Department of Transportation (GDOT). The project first created a database of all structures in three pilot counties using data from county and municipal officials. Then, the State of Georgia developed data sharing agreements with seven internet service provider companies in the pilot counties. In this case, provider data described broadband availability at the level of individual addresses rather than census blocks. The pilot project demonstrated that FCC maps misidentified about 50% of the locations without broadband.

The next phase of the project evaluated each of Georgia's 165,310 census blocks and over 3.5M locations. To accomplish this, all existing providers were required to share (under trade secret protection) data about all of their broadband serviceable locations. A statewide map for Georgia was published on June 15th, 2021, approximately two years after the start of the project. This map will be updated annually, with a team at the University of Georgia's Carl Vinson Institute of Government tasked with ensuring data accuracy and completeness.

This project appears to be the most comprehensive, high-resolution, state-level mapping effort in the country to date. Massachusetts executed a similar short-term mapping project between 2009 and 2015, but has discontinued maintenance of the maps generated from that effort.

Census block-level mapping

Wisconsin, North Carolina, and California are currently generating broadband maps using provider and community anchor institution (e.g., schools, libraries) data at the census block level. These projects all acknowledge the aforementioned issues with census block methodology, but focus on census block or county-level statistics such as percent of households that have adopted broadband, broadband service pricing, access to subsidies, and built infrastructure to identify region-specific barriers to broadband adoption.

Several states, including Iowa, Michigan, and Ohio, have worked to create state-level broadband availability maps with Connected Nation, a nonprofit organization initially developed at Western Kentucky University to promote broadband expansion. In Iowa, for example, Connected Nation partnered with the Iowa Public Service Commission and service providers to create several different statewide maps, with the aim of regularly updating them as new data is gathered. These maps display the number of providers, advertised internet speeds, and user-provided download speeds at the census block level. To date, Connected Nation has worked with partners in 42 states, not including Missouri, to create broadband maps or promote educational initiatives related to digital literacy and broadband adoption.

Crowdsourced mapping

Finally, several states have foregone collecting data from providers in favor of crowdsourcing consumer data. For example, West Virginia relies on consumer internet speed tests to generate maps of broadband availability. States such as Maine and Pennsylvania have worked with Measurement Lab, a consortium of industry and research institutions, to generate coverage maps from consumer speed tests. A notable drawback of this data-gathering methodology is that it often lacks address-level confirmation (i.e., there is no external validation of reported speeds and addresses). Self-reported speeds can also vary due to a variety of factors on the user end, such as the type and number of devices or programs in use on a home wireless network. Additionally, this method relies on high participation rates, so maps relying solely on speed test data will likely be incomplete and may create ambiguity; areas that appear to be unserved may actually result from lack of user participation.

Broadband maps in Missouri

In 2019, USTelecom, a telecommunications trade association, completed a pilot program in Missouri and Virginia that created maps of every broadband serviceable structure in three counties in each state. The pilot program was managed by CQA, a telecommunications consultancy, and involved collaboration between USTelecom, ITTA, WISPA, AT&T, CenturyLink, Chariton Valley, Consolidated, Frontier, Riverstreet, TDS, Verizon, and Windstream. This project estimated that as much as 38% of rural locations in census blocks that are reported as served using the current FCC approach are actually unserved. They also propose that a national dataset of all broadband serviceable locations could be compiled in 12-15 months using their approach.

Similar to other state-level approaches, CQA used FCC data, tax assessor data, and commercial data sets to generate maps of broadband serviceable structures. However, they then developed and applied statistical techniques (which they do not make public) to combine and refine the data sets into an aggregate map. One challenge to this methodology was that linkage between tax records and geographic parcel records was often imperfect and required reconciliation. CQA used aerial imagery to reconcile data disagreements, but structures are not always visible in these images depending on when they were taken. They note that county assessor records, such as parcel attributes and parcel geometry are not necessarily standardized, which can complicate data matching. They recommend tax assessors standardize classifications for land use, and that that address filing formats be standardized as well. Map accuracy was improved with better local assessor data (including accurate land parcel boundaries) and visual verification. Visual verification is "the process of having a human review satellite imagery to address areas of low confidence," and is best applied as a final step after creating preliminary maps since not every structure identified will necessarily require broadband service.

Another project in Missouri, the Missouri Broadband Resource Rail, uses FCC data, Microsoft usage data, service provider availability by census block, terrain data, and co-op territory boundaries to generate a map with several layers of broadband-related information. The site also contains a speed test that allows users to submit data that can be incorporated into existing maps.

Future approaches and challenges

In March 2020, U.S. Congress passed the Broadband Deployment Accuracy and Technological Availability (DATA) Act. This bill requires the FCC to change the way broadband data is collected, verified, and reported. Specifically, the FCC must collect and share broadband service availability data from wired, fixed-wireless, satellite, and mobile broadband providers with address-level resolution. To do this, the FCC is required to establish the Broadband Serviceable Location Fabric, a dataset of geospatial-coded information for all broadband serviceable locations. In the February 2021 Open Commission Meeting, the FCC indicated the new broadband maps may not be ready until 2022.[3]

The Broadband DATA Act also creates new transparency and oversight requirements. The FCC must specify requirements for service availability data collected from providers, and it must create a challenge process to enable the submission of independent data challenging FCC broadband maps. In addition, the FCC must conduct regular audits of information submitted by providers, and it must develop a process allowing outside entities to submit information about broadband deployment and availability to verify and supplement provider data. The FCC must also provide data collection and submission assistance to Indian tribes, small service providers, consumers, and state, local, and tribal governments.[3]

Looking ahead, the FCC Technology Advisory Council has also highlighted the potential expansion of artificial intelligence/machine learning techniques in identifying and validating broadband serviceable locations from data sets such as aerial imagery. Such technologies may improve the accuracy of geocoded structures, and speed up the structure identification and validation process.[4]

Despite these advances, several challenges to creating accurate, up-to-date broadband availability maps still remain. For one, many maps still do not reflect affordability, which is a major barrier to broadband access, particularly in urban and low-income communities. The use of Census data also poses an ongoing challenge, since certain groups, such as individuals in rural settings, historically have relatively low response rates. As mentioned above, collecting reliable mobile broadband data remains a challenge due to user-side factors such as location, weather, terrain, and network use.

References

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