Reducing Digital Discrimination and Stressors by Improving Broadband Adoption in Historically Redlined Areas

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Executive Summary: Broadband adoption is a determinant of health that intersects with other sociological determinants such as education and employment. Due to the rising reliance on digital technology, lack of broadband adoption prevents individuals from accessing the essential resources needed to fully participate in 21st century educational and employment opportunities. Vulnerable populations experience greater impacts of divestment, and therefore experience greater sociological stressors and worse health outcomes. These communities are left behind with slower services and more expensive internet service plans, as physical proximity to broadband does not necessarily predict broadband adoption. The benefits of broadband adoption and the harms of its absence are magnified for youth and other vulnerable groups, with youth relying more heavily on digital services. The author recommends that the Federal Communications Commission (FCC) Task Force to Prevent Digital Discrimination increase broadband adoption for vulnerable communities by strengthening community-based partnerships to provide culturally competent resources and adopting equity-based national digital health standards that provide greater transparency of data and accountability for discriminatory deployment decisions.

I. Patterns of divestment

While approximately 5 million rural households do not have access to in-home broadband services, this problem is magnified in diverse urban communities. In densely populated cities, three times as many households lack access to in-home broadband (Horrigan 2019). Broadband non-adoption rates are higher among communities of color and households with lower socioeconomic status, and urban areas tend to have clusters that fit these demographics (Anderson 2019). Even in areas where broadband connection is in physical proximity, adoption rates are low due to other barriers. 18.1 million households nationally do not have a subscription to any form of broadband service (Tomer et al. 2020). These limitations widen socioeconomic achievement gaps, affecting the well-being of low-income youth and families. Alongside democratizing access to education, broadband plays an important role in

improving economic and social outcomes as well as decreasing social isolation for traditionally marginalized groups.

There is a prominent pattern of preferential broadband investment and deployment in higher-income communities over investment in lower-income communities. This practice, referred to as "digital redlining," leaves low-income communities—particularly low-income communities of color—without equal access to affordable, high speed internet services. Increased digital inequities likely are the result of discriminatory home ownership policies enacted by the federal government in the 1930s. For example, the Home Owners' Loan Corporation enacted subsidies for constructing whites-only suburbs and tax exemptions for institutions that enforced segregation (Rothstein 2017), denying communities

of color the opportunity to build generational wealth through homeownership.

Today, in areas where laws and commercial actors have denied loans to communities of color for over 90 years, there are "[b]elow average internet speeds, low internet adoption rates, and internet access costs are a large burden relative to household income" (The Greenlining Institute 2020). This pattern of divestment exists throughout cities across the nation. A 2017 mapping analysis of Federal Communications Commission broadband availability data found that AT&T systematically discriminated against lower-income Cleveland neighborhoods in its deployment of in-home internet and video technologies (Callahan 2017). Cleveland, Ohio consists of a 51.9% Black population and remains one of the most segregated cities in the nation after facing severe redlining in the 1930s. The most severe deficits in broadband connectivity occur in districts that have a large percentage of Black residents (Callahan 2017). This analysis was repeated in the large urban cities of Dayton, Detroit, and Toledo, and Dallas (Callahan 2017; Callahan 2019). The studies strongly suggest that AT&T deployed high-speed fiber networks in higher income neighborhoods while failing to deploy the same quality fiber to lower income neighborhoods in a similar region.

II. Assessing the role of broadband adoption as a social determinant of health

Broadband access plays a direct and consequential role in health, as it affects many social determinants of health. Data suggests a significant correlation between internet adoption and improved health outcomes. Controlling for education and income, a significant correlation exists between higher broadband access with 9.6% lower diabetes prevalence (Connect2Health Research Monograph 2019). Based on the same data, the least connected counties (counties where over 60% of households lacked basic internet service) had the highest rates of chronic disease. The quality and availability of healthcare in counties with lower broadband adoption is comparably lower than in counties with broadband access, with preventable hospitalizations happening at a rate 1.5 times higher (Connect2Health Research Monograph 2019).

Most people without in-home broadband access resort to using mobile devices or traveling to a public library with free internet access. However, mobile data plans and public library access are inadequate for diminishing sociological stressors for low-income families. Non-broadband adopters indicate that they would face significant challenges in job-seeking activities such as creating a resume, contacting employers, and finding available jobs in their area (Smith 2015). Inability to find employment opportunities affects economic stability and overall health, as worse employment options leave households trapped in a cycle of generational poverty.

The average tract in areas with a concentrated poverty rate (above 20%), has an average broadband adoption of 64.9% compared to the 81.8% adoption rate in areas without concentrated poverty (Tomer, Fishbane, Siefer, and Callahan 2020). Broadband conditions in these areas may impact an entire region's access to healthcare, economic stability, and education. There appears to be a connectivity continuum where connectivity directly impacts health but additionally affects other social determinants of health.

Additionally, youth are at the forefront of broadband adoption. 71% of individuals aged 15-24 utilize internet services compared to the 48% of the total population that use the internet. This means broadband adoption acts as an amplified digital determinant of health for the youth (International Telecommunication Union 2017) as lack of broadband adoption increases socioeconomic and racial disparities. Broadband adoption is an increasingly important factor in the accessibility of education, jobs and training, communication, telehealth, and civic participation for young individuals that may not have access to these opportunities under other conditions.

III. Barriers to broadband adoption in urban areas

i. High costs for households

Determinants of health and sociological stressors contribute to digital inequities, which have been further exacerbated by COVID-19. Many of the communities unable to adopt broadband also lack access to electricity, affordable programs, utilities, and water. The cost of access is often prohibitive. 59% of unconnected households nationally cite high

costs as the primary reason for their inability to adopt home broadband services (Horrigan and Duggan 2015). Nearly 75% of expenditures for low-income households are spent towards core necessities such as food, rent, and utilities (Gennetian et al. 2021), meaning such families cannot afford to add a broadband plan to this list of expenses.

ii. Area deemed insufficiently profitable
Communities that face digital discrimination are often deemed insufficiently profitable. Houses with older infrastructure or wiring do not receive deployment of fiber infrastructure. In a two-phase study which reviewed both AT&T California's and Frontier Communications' telecommunications networks from 2010-2019, the California Public Utilities Commission determined that the examined internet service providers had an "investment focus on higher income communities" (California Public Utilities Commission 2021). The study also found that a direct correlation between competition in an area and service quality, i.e., areas that experienced divestment and had a lower number of internet service providers to choose from also experienced lower quality infrastructure, slower speeds, and fewer competitive offerings. Because of this, these communities will gradually face more expensive provider-imposed plans for worse access. Communities that lack access to fiber are excluded from the benefits of faster services. This exclusion greatly influences the quality of life and opportunities for affected communities.

iii. Basic tier plan is inadequate
For low-income households that do purchase broadband plans, basic tier plans tend to be too slow to adequately provide support and cost significantly more for each bit of data than high-speed plans (New America 2020). Basic tier plans often have data caps where the customer must pay overage charges if they exceed this artificial limit. A leaked Comcast memo details the language that customer service representatives were told to use when discussing new plans with data caps. Under the circumstances set by Comcast, depending on region, customers could opt to pay an extra $30 to $35 per month to unlock an unlimited plan. Customers who exceeded their data cap and did not sign up for this plan would automatically be charged $10 for an additional 50 GB (D'Orzazio 2015). In order to be eligible for the

Federal Lifeline Assistance subsidies, providers only need to provide an "Internet Essentials'' package with data caps as low as 3 gigabits per month (Wheeler 2020), despite the average American household using approximately 290 gigabits per month (Britt 2019). Additionally, customers who purchase basic plans are either limited by their inability to afford a more expensive plan or their inability to switch to a different service provider due to lack of competition in the area. As a result, families must accept price raises or choose to live without a crucial service.

IV. Policy options

i. Status quo: Increasing adoption through federal subsidies

Successful aspects
From 2015 to 2020, federal investment to increase broadband access subsidized the costs of building infrastructure, provided devices for students, and helped build digital skills in communities. The Infrastructure Investment and Jobs Act of 2021 provided $2.75 billion towards funding the Digital Equity Act and $14.2 billion to modify and extend the Emergency Broadband Benefit Program, transitioning it into the longer-term Affordable Connectivity Program (ACP) (Federal Communications Commission 2022). The ACP provides qualifying households with a $30 per month discount on their internet services, and as of October 2022, 14.5 million households have received ACP benefits nationally (Universal Service Administrative Company 2022). In 2022, the Broadband Equity, Access, and Deployment (BEAD) program was created, providing $42.5 billion in funds to expand broadband adoption and deployment throughout the United States. Expanding broadband access has become prevalent following the COVID-19 pandemic, and federal subsidies have increased access for millions of Americans.

Policy shortcomings
Although swift action was taken by national interagency groups to provide broadband in the midst of the pandemic, the FCC has not identified statutory provisions that facilitate coordination and alignment between federal programs and municipal level outreach. In February 2022, the FCC announced

the formation of an interagency Task Force to Prevent Digital Discrimination. However, the FCC has not yet established a national approach for increasing digital health and acknowledging broadband as a social determinant of health.

Additionally, existing measurement tools overlook critical dimensions of the digital divide. Current federal mapping often understates the number of households being served. Because requirements to provide granular data on coverage are absent, the true figure of offline households is likely double the FCC's estimates (Busby, Tanberk, and Cooper 2021). Broadband Now conducted an analysis by manually checking 11,663 random addresses through nine large internet service providers that claim to serve those areas, analyzing 20,000 provider-address combinations in total. A fifth of these addresses indicated that no service was available, suggesting that companies overstated their availability by 20% (Poon 2020). As a result, local stakeholders and municipal governments are unable to garner federal funding because the communities they are assisting have been marked as adequately served. These understated areas are often the households that have the least access to other basic needs; lack of internet service only exacerbates this inequality. Furthermore, internet service providers are not held accountable when they do not deliver adequate speeds or services to cover the needs of populations in areas considered less profitable. The following policy recommendations aim to increase communication between federal and municipal government agencies to increase adoption and enrollment of federal subsidies.

ii. Approach 1: Improve federal partnerships with local stakeholders to provide direct, culturally competent digital assistance and resources
Improvements in community and digital health can be achieved by forming stronger partnerships between the federal agencies providing benefits and local organizations that thoroughly understand the needs of their communities. The Task Force can support local stakeholders in increasing broadband access by providing local agencies with neighborhood-level census data so the most vulnerable populations are accurately identified and targeted through outreach. To do so, the Task Force should use trusted community members as points of contact for providing digital assistance and resources to a local community. These points of contact can be identified by city officials as a community member that has many relationships with local organizations, the municipal government, and the local school districts (e.g., the vice president of the school board or the executive committee member of an education non-profit). The Task Force can provide local stakeholders with specific training for assisting community members with federal assistance applications.

The Task Force can establish criteria that addresses digital determinants to help community organizations identify which populations to target more urgently. A case study of Chicago Public Schools shows that partnerships can be leveraged for a new approach to connecting students. The Chicago Connected program engaged local stakeholders including public schools for identifying families of need, community-based organizations for conducting culturally-competent digital support, and the City of Chicago Mayor's Office for serving as the primary liaison for funding. Local school districts can identify students and families most in need through six priority indicators: students eligible for free lunch, students experiencing homelessness, students with special needs, students in temporary living situations, and summer school students (Education Superhighway 2020). The Task Force should acknowledge these priority indicators as indicators of poor broadband adoption in a community and work with local stakeholders to enable families in high-need areas to adopt broadband through the federal subsidy program that best fits their eligibility. Another possible criteria would be to rank the current connectivity level of the community (unconnected, underserved, or connected) and rank the health needs of the community (high need, average need, or low need). Double burden communities that have low connectivity and high health needs can be flagged by the Task Force to reach out to and establish a partnership with an organization that serves that community.

Advantages
Federal-local partnerships that identify and address barriers to broadband adoption play a critical role in improving digital health outcomes in high-need communities. For both customers and staff, federal-local partnerships act as a trusted resource

that fosters culturally competent digital literacy and technological skills that community members can effectively use to understand digital technologies. Offering digital literacy training and assistance with federal subsidy forms in lower-income neighborhoods helps entire communities access online job and healthcare services, increasing their overall well-being (Mossberger, Tolbert, and Anderson 2014). Fostering direct engagement with the community is key for overcoming enrollment barriers and making the application process simpler particularly non-English speaking, disabled, or undocumented individuals.

Greater alignment between federal and community-based efforts would also result in greater citizen and youth participation in adoption efforts and minimized enrollment barriers. Digital training will increase student participation in community initiatives and policy decisions, as students from affected school districts can contribute their digital skills and language skills to help other community members enroll in federal adoption programs. Recruiting points of contact to help community members navigate enrollment will allow households to receive support in their native language rather than reading lengthy forms that often are translated word for word rather than in conversational jargon. Community-based partnerships can combine federal resources with local knowledge of community needs in order to most effectively serve different populations.

Disadvantages
Each community has varying existing conditions (demographics, state of existing infrastructure, unique community needs, etc.). Therefore, broadband programs will have different definitions of success based on factors such as speed, coverage, and timelines, which may cause difficulty in determining which organizations are able to leverage future federal funding or resources. Minimizing costs often requires lengthy requests for proposal processes, which may prolong the time that households are without internet services (Chandra et al. 2020). There likely will be inherent tradeoffs for communities that choose to prioritize more rapid solutions over longer-term partnerships. Local organizations that do not specialize in broadband adoption or digital assistance may not have the resources or staff to take on the additional task of

maintaining communication with federal representatives. Additionally, local stakeholders do not have access to the data and resources that are available at the federal level. Federal partners must adapt to the provider landscape and varying resource levels of local stakeholders in order to advance community efforts to provide digital training for impacted youth and greater flexibility for families.

iii. Approach 2: Adopt human-centered national digital health standards
A digital health framework would hold service providers accountable for deployment decisions made on the basis of socioeconomic status and set a standard for other non-participating broadband providers. Digital health standards will enable the Commission to determine which service providers are adequately serving the populations they claim to serve. In addition to a digital health framework, a consumer broadband label can assist consumers with understanding their broadband plan, package, and price by sharing data from providers directly with customers. The Commission should require providers to report any usage-based fees as well as additional charges and fees to be reported on the broadband label. The Commission should ensure that the information and methodology used by providers to gather the data accurately reflects the experience of users in varying regions.

The Commission's digital framework should:

- Acknowledge the effect of digital discrimination as a sociological stressor on communities of color, low-income communities, and adolescents
- Determine an area to be completely served only if they have adopted digital literacy resources and have access to culturally competent digital services
- Include additional considerations for youth populations
- Provide information for youth to protect themselves from online harms as well as ensure that youth are provided with access to broadband at home nad in places other than their schools

The Commission's consumer broadband label should:

- Prioritize information on cost, speed, and reliability and include a range of other information relevant to the consumer's plan
- Include a breakdown of any required fees, data caps, or changes in contract
- Provide a digital health score that is localized to a particular geographic region so consumers can compare their benefits with other providers' plans

Advantages

A national framework established by the Task Force would ensure that future generations and current youth can benefit from the longevity of infrastructure and improve health and well-being that adoption brings. Increased public availability of broadband data would help address the root causes of digital stressors and discrimination by preventing discriminatory practices by providers. Digital health protocols can build the power and agency of youth to shape the future of digital health.

A consumer broadband label would also increase transparency and public availability of broadband data, including the disclosure of pricing and speed information for customers. With more transparency of data, subscribers are able to make more informed choices when selecting a broadband plan, leaving them less vulnerable to digital stressors. This label will serve as a basic accountability mechanism for providers and is a critical step towards advancing digital health. With greater public awareness of digital health standards, providers receiving federal funding are held accountable by the public for providing reliable and high-speed broadband to every area claimed to be served.

Disadvantages

Standards may leave ambiguity to interpretation for newer terms related to digital health and digital discrimination. Although digital standards will increase accountability and public awareness of broadband measures, regulating the actions of providers to adhere to these standards would require stricter enforcement that may detriment smaller community providers. Additionally, the Commission may receive pushback from large national providers when trying to include digital health as a metric for broadband deployment, as current deployment strategies of providers may be affected.

IV. Consequences of inaction

While federal broadband subsidies such as the Affordable Connectivity Program will help increase the affordability of broadband services for lower-income households, relying on federal subsidies cannot be the only solution to the adoption gap. Federal subsidies do not remedy the fact that in low-income areas, households pay higher costs for worse service than households in wealthier areas. Underinvestment in communities based on their socioeconomic status has led to discriminatory "tiered" broadband access as well as disproportionately worse economic stability and digital literacy skills, which are two key social determinants of health that affect the well-being of communities that are left behind. Without action from policymakers, residents will be separated into first-class and second-class broadband markets, with lower-income communities left with limited options, slower speeds, and higher prices. If higher-income households are the only residents with access to fiber optic infrastructure, then those homeowners need only to shoulder a one-time cost of replacing the internal wiring of their home to switch to 21st century fiber optic connectivity. In contrast, homes that are not near fiber infrastructure (which are disproportionately low-income) will not have this option, and no equivalent substitute will be available.

V. Conclusion

Policymakers must reframe the digital divide as a civil rights issue of today, one that informs and determines other aspects of health. Broadband adoption is part of a connectivity continuum that influences health outcomes, quality of care, and other social determinants of health such as education. These outcomes are tied to the utilization and adoption of broadband, not simply proximity or access. It is crucial to address the widening socioeconomic and racial gaps that result from lack of adoption. To do so, policymakers must understand the barriers to digital adoption and address these barriers through connections with trusted community based organizations, transparency and public availability of data, and national criteria for digital inclusion. Strategies that acknowledge and

work to decrease digital and sociological stressors are key for mitigating digital discrimination and inequality. Improving partnership with community based organizations will improve community awareness regarding where and how to access digital services. With strong community engagement in historically underserved communities and a framework for providers that centers around longevity and improving digital health for future generations, broadband adoption can create an environment that promotes attaining full potential for health and well-being for all.

Therefore, the author recommends that the Federal Communications Commission's Task Force to Prevent Digital Discrimination increase local participation in policy by strengthening partnerships with community based organizations as well as increasing transparency of data and developing a digital health framework for providers. Doing so would be a historic step not only towards closing the digital divide, but also meeting the government's statutory obligations to promote access to the most technologically advanced broadband services to all communities in a nondiscriminatory and equitable manner, regardless of socioeconomic status.

References

Anderson, Monica. "Mobile Technology and Home Broadband 2019." Pew Research Center. June 13, 2019. https://www.pewresearch.org/internet/2019/06/13/mobile-technology-and-home-broadband-2019/.

Britt, Phil. "Report: U.S. Household Broadband Data Consumption Hit 268.7 Gigabytes in 2018." Telecompetitor. January 2019. https://www.telecompetitor.com/report-u-s-household-broadband-data-consumption-hit-268-7-gigabytes-in-2018/.

Busby, John, Julia Tanberk, and Tyler Cooper. "BroadbandNow Estimates Availability for all 50 States; Confirms that More than 42 Million Americans Do Not Have Access to Broadband." May 5, 2021. https://broadbandnow.com/research/fcc-broadband-overreporting-by-state.

Callahan, Bill. "AT&T broadband deployment skipped low-income Dayton neighborhoods." National Digital Inclusion Alliance. March 22, 2017. https://www.digitalinclusion.org/blog/2017/03/22/att-skipped-low-income-dayton-neighborhoods/.

Callahan, Bill. "AT&T's Digital Redlining of Cleveland." National Digital Inclusion Alliance. March 10, 2017. https://www.digitalinclusion.org/blog/2017/03/10/atts-digital-redlining-of-cleveland/.

Callahan, Bill. "AT&T's Digital Redlining of Dallas: New Research by Dr. Brian Whitacre." National Digital Inclusion Alliance. August 6, 2019. https://www.digitalinclusion.org/blog/2019/08/06/atts-digital-redlining-of-dallas-new-research-by-dr-brian-whitacre/.

Callahan, Bill. "More digital redlining? AT&T home broadband deployment and poverty in Detroit and Toledo." National Digital Inclusion Alliance. September 6, 2017. https://www.digitalinclusion.org/blog/2017/09/06/more-digital-redlining-att-deployment-and-poverty-in-detroit-and-toledo/.

Chandra, S., Fazlullah, A., Hill, H., Lynch, J., McBride, L., Weiss, D., Wu, M. (2020). Connect all students: How states and school districts can close the digital divide. San Francisco, CA: Common Sense Media.

CPUC. Network Exam of AT&T and Frontier/Verizon. California Public Utilities Commission. 2021. https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/service-quality-and-etc/network-exam-of-att-and-frontier-verizon.

D'Orazio, Dante. "Leaked Comcast memo reportedly admits data caps aren't about improving network performance." The Verge. November 7, 2015. https://www.theverge.com/smart-home/2015/11/7/9687976/comcast-data-caps-are-not-about-fixing-network-congestion.

Education Superhighway. "Case Study: Chicago Connected." Education Superhighway. July 2020. https://www.educationsuperhighway.org/blog/case-study-chicago-connected/.

FCC. "Emergency Broadband Benefit." Federal Communications Commission. 2022. https://www.fcc.gov/broadbandbenefit.

FCC. "Studies and Data Analytics on Broadband and Health." Federal Communications Commission. 2019. https://www.fcc.gov/health/sdoh/studies-and-data-analytics.

Frontier Communications. "Presentation to Unsecured Bondholders." Frontier Communications. January 2020. https://www.sec.gov/Archives/edgar/data/20520/000114036120007104/nc10009883x2_ex99-1.htm.

Gennetian, Lisa. "How Do Low-Income Families Spend Their Money?" The Econofact Network. November 15, 2021. https://econofact.org/how-do-low-income-families-spend-their-money.

Horrigan, John. "Analysis: The Digital Divide Isn't Just A Rural Problem." The Daily Yonder: Keeping It Rural. August 14, 2019. https://dailyyonder.com/analysis-digital-divide-isnt-just-a-rural-problem/2019/08/14/.

ITU. ICT Facts and Figures 2017. International Telecommunications Union. July 2017. https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2017.pdf.

Marcattilio-McCracken, Ry. "Digital Navigators Help Communities Overcome Barriers to Broadband Adoption." Institute for Local Self-Reliance. August 31, 2020. https://muninetworks.org/content/digital-navigators-help-communities-overcome-barriers-broadband-adoption.

New America. "The Cost of Connectivity 2020." 2020. https://www.newamerica.org/oti/reports/cost-connectivity-2020/global-findings/.

Poon, Linda. "There Are Far More Americans Without Broadband Access than Previously Thought." Bloomberg. February 19, 2020. https://www.bloomberg.com/news/articles/2020-02-19/where-the-u-s-underestimates-the-digital-divide.

Rothstein, Richard. The Color of Law: A Forgotten History of How Our Government Segregated America, 13 (purposeful segregation), 70 (whites-only suburbs) 102 (tax exemptions for whites-only facilities).

Smith, Aaron. "Lack of broadband can be a key obstacle, especially for job seekers." Pew Research Center. December 28, 2015. https://www.pewresearch.org/fact-tank/2015/12/28/lack-of-broadband-can-be-a-key-obstacle-especially-for-job-seekers/.

The Greenlining Institute. "On the Wrong Side of the Digital Divide: Life without internet access, and why we must fix it in the age of COVID-19." The Greenlining Institute. June 2, 2020. https://greenlining.org/publications/online-resources/2020/on-the-wrong-side-of-the-digital-divide/.

Tolbert, Caroline, Christopher Anderson, and Karen Mossberger. "Digital Literacy Is a Game Changer: A Neighborhood-Level Analysis of Chicago's Smart Communities." Brookings Institution. October 27, 2014. https://www.brookings.edu/blog/techtank/2014/10/27/digital-literacy-is-a-game-changer-a-neighborhood-level-analysis-of-chicagos-smart-communities/.

Tomer, Adie, Lara Fishbane, Angela Siefer, and Bill Callahan. "Digital prosperity: How broadband can deliver health and equity to all communities." Brookings Institute. February 27, 2020. https://www.brookings.edu/research/digital-prosperity-how-broadband-can-deliver-health-and-equity-to-all-communities/.

Trollip, Alex. "Understanding the Urban Digital Divide." Bipartisan Policy Center. March 5, 2021. https://bipartisanpolicy.org/blog/urban-broadband-blog/.

USAC. ACP Enrollment and Claims Tracker. Universal Service Administrative Company. October 2022. https://www.usac.org/about/affordable-connectivity-program/acp-enrollment-and-claims-tracker/.

USC. "California surpasses 90 percent internet connectivity, but low-income households still lack access." University of Southern California. March 20, 2021. https://news.usc.edu/183952/california-internet-access-usc-survey-broadband-connectivity/.

Wheeler, Tom. "5 steps to get the internet to all Americans: COVID-19 and the importance of universal broadband." May 2020. https://www.brookings.edu/research/5-steps-to-get-the-internet-to-all-americans/.

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