# Digital Inequities and Disparities: Technology Access for Michigan Students

## Issue Brief Technical Appendix

## Methods and Data

This technical appendix provides additional information about the methods, data, and analytical strategy that were used in PPA's Issue Brief, "Digital Inequities and Disparities: Technology Access for Michigan Students."

Access to different types of broadband technologies is correlated to income, geographic location, and urbanicity. The Federal Communications Commission (FCC) defines broadband as, ". . . high-speed Internet access that is always on and faster than traditional dial-up access."[1] Broadband can be transmitted using several different forms, including: digital subscriber line (DSL); cable modem; fiber optic; wireless; satellite; and broadband over power line (BPL). The National Broadband Plan stipulates download speeds of at least 100 Mbps and upload speeds of at least 50 Mbps are considered as high-quality broadband.[2] Broadband has significant effects on unemployment rates and faster job growth for skilled workers and for a college-educated workforce.[3]

To understand the access to Internet, broadband, and computers at home, the analysis for this issue brief uses data drawn from the American Community Survey (ACS) administered by the U.S. Census Bureau (2018). Since 2013, the ACS has collected data required under the 2008 Broadband Data Improvement Act. Data collected through the Current Population Survey (CPS) potentially include more detail through its longer questionnaire and longer time series. However, the ACS, with a larger sample, provides better estimates for small population groups and with more details related to geographic area.[4] Three relevant ACS questions (asked since 2016) were included in these data with those relying on cellphones coded as not having a computer.

Data were downloaded from the ipums.org website,[5] which maintains formatted ACS data. We used both household and individual-level variables. Respondents who resided in group quarters and did not have family income data were excluded. Because the focus of this brief is the availability of and access to technology for school-aged children, the sample was restricted to individuals who were between 5 and 17 years of age.

---

[1] "Types of Broadband Connections," Federal Communications Commission (FCC) updated June 23, 2014, accessed April 10, 2020, https://www.fcc.gov/general/types-broadband-connections.

[2] Elizabeth Mack, "Businesses and the Need for Speed: The Impact of Broadband Speed on Business Presence," *Telematics and Informatics* 31, no. 4 (2014): 617-627.

[3] Bento J. Lobo, Md Rafayet Alam, and Brian Whitacre, "Broadband Speeds and Unemployment Rates: Data and Measurement Issues," *Telecommunications Policy* 44, no. 1 (2020).

[4] Camille Ryan, "Computer and Internet Use in the United States: 2016," U.S. Census Bureau, August 2018, accessed April 10, 2020, https://www.census.gov/content/dam/Census/library/publications/2018/acs/ACS-39.pdf.

[5] Steven Ruggles, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas and Matthew Sobek, IPUMS USA: Version 10.0 [dataset], Minneapolis, MN: IPUMS, 2020. https://doi.org/10.18128/D010.V10.0

ACS demographic and geographical data were used to identify inequalities in access to technology, including: race and ethnicity, poverty, and geography. Geography was analyzed separately by residence in a metropolitan area and in one of five geographic regions within Michigan: the Upper Peninsula (UP), Northern, East-Central, Western, and Southwestern areas of the Lower Peninsula. Estimates and standard errors were derived using standard techniques.

## Research Notes

- Sample sizes were too small to identify statistically significant differences between counties or groups of counties. Although we considered using the five-year ACS sample, this possibility was rejected because: (a) there might be differential trends in technology access over time; and (b) the ACS question on Internet access was changed in 2016.
- Southeast Michigan has statistically significant greater broadband access than all regions except for the UP, although this is partly due to the smaller UP sample size and hence larger standard error.
- Race and ethnicity were re-coded as White, Black, Asian, Native American, Multiple Races/Other, and Hispanic. Hispanic was treated as an inclusive category (so that all other racial/ethnic categories are non-Hispanic).
- Family poverty status was determined using the ACS total family income variable. All children living in families with total income below the 2018 federal poverty guidelines were coded as in poverty.
- Metropolitan status was determined by collapsing all households in a federally defined metropolitan area (which includes suburbs) into a simple 1/0 dichotomy.
- In producing estimates for five different regions within Michigan grouped together according to the Michigan Department of Health and Human Services Business Service Center (BSC) classification, while separating the UP from the rest of the northern region, data from Public-Use Microdata Areas (PUMAs) in each BSC area were combined.
- Because PUMAs do not map neatly onto BSC areas, three counties were linked to a different region (Arenac and Gladwin to the northern region and St. Joseph to the western region).
- Estimates were weighted using individual-level weights, and standard errors produced through balanced replicate weights.