



# Public libraries and residential broadband adoption: Do more computers lead to higher rates? ☆



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## ABSTRACT

Providing access to computers with high-speed Internet connectivity is a central mission of public libraries in the United States. One pertinent, currently unanswered question is whether library Internet access leads to increasing residential broadband adoption rates in the communities that the libraries serve. This paper uses simple county-level regression analysis to document a positive association between a higher number of libraries and household broadband adoption rates as of 2013—but only in rural areas. This correlation does not imply causation, however. A propensity score matching technique is used to demonstrate that counties with libraries that aggressively increased their number of Internet-accessible computers between 2008 and 2012 did not see measurably higher increases in their rates of residential broadband adoption. These findings lend themselves to future research questions including how to appropriately measure broadband ‘adoption’ outside of the home and methods for engaging library patrons that ultimately encourage residential broadband adoption.

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## 1. Introduction

A key role for most public libraries across the United States is the provision of publicly accessible Internet-connected computers. This type of access is crucial for introducing many late adopters to the benefits of computers and the Internet (Barber & Wallace, 2008). In recent years library connections have become increasingly high-speed and can be used to demonstrate important online applications such as applying for jobs, looking up and interacting with government agencies, developing an online presence for a small business, social networking, and improving one's education. The median library in a metropolitan county contained 74 public-use Internet-connected computers and provided over 74,000 hours of use on those computers in 2012. Individuals who have benefited from public computers and digital literacy training in libraries may be better able to see the Internet's value—and might eventually purchase a new broadband Internet subscription at home. However, as Horrigan (2014) noted, there has been little research related to assessing outcomes from Internet access at public libraries.<sup>1</sup> Scholars have argued that public libraries need these data to justify

their value and requests for government funding (Mandel, Bishop, McClure, Bertot, & Jaeger, 2010).

While there have been many surveys of the social, educational, and economic benefits of public computing resources for library patrons, fewer studies have attempted to empirically measure specific outcomes related to public library Internet access, such as increased rates of broadband adoption. In particular, using rigorous econometric models in conjunction with outcome data that is external to the library system itself can make compelling arguments about the ultimate impact of libraries. In the current era of lower government spending and increased competition for scarce public resources, documenting measurable impacts of the services that libraries provide is of the utmost importance. One hypothesis would be that the provision of this type of free broadband access (and any associated training that may occur) might lead to increased levels of residential broadband adoption as individuals learn about how they can incorporate the technology into their own lives.<sup>2</sup> Alternatively, other types of community anchor institutions (CAIs) such as schools, hospitals, universities, or government agencies could also influence the propensity of nearby residents to adopt broadband in their home (Jayakar, 2011; Mandel, Alemanne, & McClure, 2012).

This paper uses county-level empirical data to test: (1) whether a relationship currently exists between levels of residential broadband adoption and the prevalence of libraries, and (2) whether libraries

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<sup>1</sup> Horrigan's direct quote is “[There is a need for] intentional research question frames to assess outcomes from Internet access at the library. ...you get questions from policy makers on what are the outcomes, what dial was moved. And I think we have to be very intentional about that.”

<sup>2</sup> While the official definition of “broadband” has varied over time, the 2014 Federal Communications Commission definition was to provide at least 4 Megabytes per second (Mbps) download and 1 Mbps upload speeds.

that aggressively increased their numbers of Internet-connected computers (or hours of computer use) between the period 2008 to 2012 led to higher residential broadband adoption increases over that time.<sup>3</sup> The results suggest that as of 2013, there is a positive association between a higher number of libraries and household broadband adoption rates—but only in the most rural counties. This association holds even after controlling for other factors known to impact the adoption decision, such as income, education, age, and the availability of broadband infrastructure. Interestingly, libraries are the only type of community anchor institution (CAI) that exhibit this relationship. However, correlation does not imply causation, and a propensity score matching technique demonstrates that libraries in the top quintile in terms of increasing their number of public Internet computers (or hours of computer use) between 2008 and 2012 did not see any measurably higher increases in their local rates of residential broadband adoption over that time.

## 2. Review of the literature

Public libraries have played a key role in providing public access to computers and the Internet since the early 1990s. As Bertot, Jaeger, Langa, and McClure (2006) noted, “In the decade between 1994 and 2004, Internet connectivity in U.S. public libraries jumped from 20.9 percent to 99.6 percent”. In their 2011–2012 study, Bertot, McDermott, Lincoln, Real, and Peterson (2012) discovered that 100 percent of all public library branches offered public Internet access, which they explained “was consistent with the 99.3 percent reported in 2010–2011 and 99.0 reported in 2009–2010” (p. 4). Broadband connectivity has been considered a national priority in the United States (Jaeger, Bertot, McClure, & Langa, 2006), and public libraries continue to be one of the only providers of free Internet access in the community, which is important for adults who live in lower-income households. A 2013 study for the Pew Internet & American Life Project found that 56% of Internet users without home access classify public libraries’ computers, Internet, and printers as ‘very important’ to them, compared with 33% of all respondents, (Zickuhr, Rainie, Purcell, & Duggan, 2013). Unfortunately, many public library computers, particularly those located in rural and tribal communities, continue to lack access to high-speed Internet connections.

The benefits of the public library’s provision of free Internet access have been extensively laid out in the literature, most notably through a series of national surveys conducted by John Bertot, Charles McClure and their associates (Bertot, Jaeger, McClure, Wright, & Jensen, 2009; Bertot & McClure, 1997, 2000; Bertot, McClure, Thomas, Barton, & McGilvray, 2007; Bertot, McClure, & Thompson, 2002, 2007, 2009). These surveys of public libraries typically have high response rates (80% or greater) and provide a wealth of detailed information regarding public library Internet connectivity and use. For example, digital literacy training at public libraries helps patrons gain access to education, workforce development, health and wellness information, e-government services, and opportunities for civic engagement (Bertot et al., 2014). Other researchers, however, have voiced concerns that the training provided at libraries is too limited to truly help participants be competitive in a knowledge-based economy (Stevenson, 2009). Researchers have also found that public library computing and Internet access can address community information needs in emergency situations. Bertot, McClure, and Jaeger (2008) found that “in the Gulf Coast states, 96.1 percent of Mississippi libraries, 87.9 percent of Louisiana public libraries, 87.3 percent of Florida public libraries, and 64.5 percent of Alabama

public libraries report use of their public computing and Internet access services to access emergency relief services and benefits” (p. 290).

More recently, public libraries have been identified as essential stakeholders in efforts to promote “digital inclusion,” which has been described as a policy-driven approach to address issues of digital opportunity, access, knowledge, and skill (Bertot et al., 2014). Government agencies, scholars, and practitioners have documented the important role of public libraries in providing digital literacy training, which can help individuals, particularly in low-income areas, to overcome barriers to broadband adoption and utilization (Dailey et al., 2010; Federal Communications Commission, 2010; Institute of Museum & Library Services, 2012; Rhinesmith, 2012). Although initiatives such as the “Digital Inclusion Survey” (Bertot et al., 2014) have attempted to measure the outcomes associated with computers and Internet access at public libraries in the United States, their results generally come from surveying the libraries themselves. Fewer studies have used data external to the library system to assess the potential relationship between libraries and residential broadband access or adoption.

The few studies that have taken this approach have typically sought to determine how broadband access (and the resulting influx of information) might impact the use of libraries. Bekkerman and Gilpin (2013) hypothesized that the growth in local Internet access increases the value of information that can be found in a library, and use a fixed effect model on panel data from 2000 to 2008 to estimate this relationship. Each of their models finds a positive relationship between residential Internet access and public library content demand. However, their broadband infrastructure data is from the FCC Form 477, which is based off of the number of local Internet providers. There are significant downsides to this data, including that a provider can claim to serve an area if only one subscriber exists, and that the number of providers in an area is not necessarily related to the percentage of residents with broadband access. The National Broadband Map (NBM) data that are used in this study addresses several of these problem areas. In a similar study, Kinney (2010) used a random effects model and data from 1998 to 2006 to demonstrate that the presence of public Internet terminals in a library has a positive impact on library visits and reference transactions. Interestingly, however, he found that increasing the number of public Internet terminals over time has no effect on library usage.

This focus on impacts to libraries is understandable given the potential influence of broadband on the overall role of a library; however, it is the impact of the library on local residential adoption rates that could represent a true success story and provide empirical evidence on how libraries are improving their local communities. Recent research has demonstrated that broadband infrastructure plays an important role in both urban and rural economic development by improving the capability of the labor force and the quality of communication between firms (Kolko, 2012; Koutroumpis, 2009; Stenberg et al., 2009). Even more striking, several recent findings point out that it is residential broadband adoption, and not simply access to the technology, that is truly driving economic development in rural areas (Whitacre et al., 2014a,b). This suggests that increases to income and jobs may result from residents who take advantage of the education and earning opportunities presented by broadband. As libraries make their case for continued or increased funding, demonstrating that the services provided lead to improved local economies would be an important tool to possess.

One question worth considering is whether the use of public computers at libraries is high enough to potentially have an impact on residential broadband adoption rates. The percentage of the population using library computers has risen from 1.4% in 1999 to over 6% by 2004, and one more recent report has put it as high as 32% in 2011<sup>4</sup> (Becker et al., 2011; Harwood & Rainie, 2004; NTIA, 1999). More than 90% of public libraries offer formal or informal technology training,

<sup>3</sup> Note that this paper explicitly focuses on home (residential) broadband adoption, and does not look at small business use. Further, as the data section will detail, our source of information on residential broadband adoption only includes wired connections such as cable Internet or Digital Subscriber Lines. Wireless/cellular access through personal mobile devices is not included.

<sup>4</sup> This 32% statistic is significantly higher than prior estimates and is likely due to the survey’s methodology. In particular, the vast majority of the 50,000 completed surveys came from library patrons (thus likely biasing the results).

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