**Telemedicine in Public Libraries: Innovation Among Early Adopters**

**Abstract**

Despite inequitable access to telemedicine video visits for those lacking home-based broadband, and the ability of public libraries to address this gap, the adoption of telemedicine in public libraries has been slow. The purpose of this research is to describe the implementation experience of five libraries and library programs that were among the earliest adopters of telemedicine in public libraries. This research was guided by the Reach, Efficacy, Adoption, Implementation and Maintenance implementation framework. A range of models have been implemented, but the most successful models include partnership with health providers or a health system. Dissemination of early adopters’ experiences can aid other libraries to learn from their example, enabling more rapid uptake of this important programming.

Telemedicine video visit (VVs) involve the use of technology to enable a synchronous virtual healthcare visit. For patients who live long distances from care providers, VVs offer the significant advantage of seeing their provider without incurring the potentially significant costs and time involved in travel. However, because high speed broadband internet is needed for a patient to have a VV, access to VVs is not equitably available to all populations, leaving those without broadband and with limited digital literacy skills unable to take advantage of the technology (DeGuzman et al. 2020). Public health and library leaders have long advocated for public libraries to be available telemedicine sites for residents with insufficient home broadband access (“A National Public Policy Agenda for Libraries and the Policy Revolution Initiative” 2015; DeGuzman, Siegfried, and Leimkuhler 2020; Clapp 2010); yet until the onset of the coronavirus pandemic of 2019 (COVID-19), there were no known telemedicine in public library (TIPL) programs in the U.S., and since COVID-19, uptake has been slow (DeGuzman, Jain, and Loureiro 2021).

TIPL is situated within a long history of librarians connecting community members with health information and services (Rubenstein 2012). Today, nearly all public librarians have received some training in public health topics (Powell et al. 2022), but although librarians understand and value the importance of connecting consumers to appropriate health information, their knowledge about health topics varies widely (Rubenstein 2018). However, the Network of the National Library of Medicine reports that a growing number of librarians have been certified as Consumer Health Information Specialists (over 1,000 by 2021), representing their sophisticated knowledge of how to locate quality consumer health information, technologies, and services (Medical Library Association 2022).

Alongside a growing interest by librarians in connecting their community members with health information and services, a parallel effort has begun to be undertaken by researchers rigorously studying implementation of library-based health-related programming aimed at underserved populations. Although few studies have evaluated the impact of these programs on health outcomes, notably, Lenstra and colleagues evaluated a national public library-based strength training program aimed at older adults living in predominantly in rural communities and found the program to be effective at producing statistically significant improvements in weight and strength (Lenstra et al. 2022).

Overall, librarians and healthcare providers are highly supportive of TIPL, due to the impact it can have on improving healthcare access, but both groups have concerns about implementing the practice. For example, a study by DeGuzman et al. (2021) found that rural public librarians are concerned about their ability to provide a private setting. In particular, rural librarians have identified that lack of funding limits their ability to make even small changes to the library, changes which are often needed to hire extra staff or ensure privacy for the patient. Further, librarians lack information about how healthcare privacy standards apply to a library providing a site for a private visit. Healthcare providers have similar concerns about the ability of their patients to have a private healthcare visit in a library and are concerned about the ability of libraries to provide adequate technological support, likely because many are unaware of the role of public libraries play in linking community members with digital information (DeGuzman et al., n.d.).

Diffusion of Innovations

The spread of novel technology and programs is often hampered by slow uptake. As described by Rogers (2003), *innovators* and *early adopters* play a critical role in the spread of innovation. Those who are quicker to adopt new technology and programs take on the initial risk of failure and financial loss as they delve into unknown territory, thereby creating a safer path for others to follow. As such, the earliest adopters are known for having a higher risk tolerance than those more reluctant to innovate. Their willingness to take on new challenges along with the accompanying risk allows new ideas to flow into a system, overcoming some of the uncertainty about adoption. As such, innovators and early adopters are often sought after for advice by those considering incorporation of the new technology.

Originally published in 1962, Rogers’ theory has been applied widely over the last 60 years to help explain adoption of new health initiatives (Greenhalgh et al. 2004), and continues to be used today. For example, the framework was recently employed to study uptake of medical abortion prescriptions among Canadian physicians (Norman et al. 2019). Rogers’ framework has been applied to a lesser extent to adoption of new technology in public libraries. Neo and Calvert applied the theory to their analysis of public libraries across New Zealand adopting Facebook as a tool for building customer engagement, in order to better understand motivations of both early adopters and those who resisted (Neo and Calvert 2012).

In the case of TIPL, understanding the early adopters’ experience can provide guidance to spur on further adoption, allowing later adopters to interpret this information and make their own decisions about if, how, and when to implement the programming. Thus, the purpose of this research is to describe the implementation experience of libraries and library programs that were among the earliest adopters of TIPL.

**Methods**

To understand the experience of the earliest adopters of TIPL, we used a qualitative multi-case research study design, which is commonly used to evaluate adoption of innovation (Yin 1984). The research was approved by the University of Virginia Institutional Review Board for Social and Behavioral Science.

To be eligible to participate in the research, individuals needed to have been involved in development of a TIPL program. Those who were working with programs that were currently open to patients were eligible to participate, and those who were considering adoption but had not yet implemented a program were ineligible. TIPL programs were identified through the media and personal connections. Potential participants were recruited over email. If they agreed to participate, informed consent was obtained prior to the interview. Five libraries or library systems across the U.S. were identified, and 14 individuals associated with the programs participated in the interviews. Each participant was offered a $25 gift card for their participation. Interviewers used a semi-structured interview guide aimed at capturing information about each library or library system, the community it served, and specifics of TIPL implementation from the perspective of the interviewee. A version of the interview guide for library directors, librarians and library workers is presented in Figure 1.

All interviews were conducted between July and October of 2021. Interviews were recorded and transcribed verbatim using Zoom for initial transcription. All transcripts were edited for accuracy and uploaded into Dedoose (Version 9.0.17; SocioCultural Research Consultants, LLC). Interviews were coded by three members of the research team (P.D., N.J. and H.A.)

Codes were developed and organized using a combination of inductive and deductive strategies. We began with an open coding strategy by one member of the research team (N.J.) Two additional members of the team (P.D. and H.A.) reviewed the codes. The group collaboratively discussed code application until consensus was reached. Next, we categorized codes as either *adoption,* *intervention* and *maintenance,* in alignment with the Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) framework. RE-AIM is a research framework that can be used to evaluate real-world implementation of health interventions (Glasgow, Vogt, and Boles 1999). Each element of RE-AIM refers to one of five dimensions necessary to understanding how an intervention may be impacting health. As such, *reach* refers to the number of people, and relative representation of people who use the intervention; *effectiveness* refers to the impact of the intervention on health outcomes; *adoption* refers to the number, and relative representation of settings adopting the intervention; *implementation* refers to the consistency of adoption across settings; and *maintenance* refers to the extent to which the program becomes part of the organization’s ongoing practices (Gaglio, Shoup, and Glasgow 2013). RE-AIM is frequently used to analyze success and barriers of implementing community health initiatives for reducing health disparities in difficult-to-reach populations, such as with an intervention aimed at increasing physical activity across five limited-resource counties in Wyoming. Researchers found that clinics were able to adopt and implementation the program initially, but were less successful expanding program reach to clients and maintaining the program over time (Balis and Strayer 2019). Similarly, researchers evaluating implementation of a clinic-based electronic health record for clients of rural clinics across British Columbia found that while clinics adopted the practice initially, reach and effectiveness with patients was low, but implementation was inconsistent across settings, and no clinics maintained the program beyond the initial roll-out (Davis et al. 2022). Because little evidence is yet available about the impact of TIPL on individual patients, we focused our analysis on the settings themselves, leading us to analyze the *AIM* dimensions of the framework.

**Results**

Five libraries or library systems across the U.S. were identified, and 14 individuals associated with the programs participated in the interviews. To help protect participants’ anonymity, each program is identified in this manuscript with an anonymized case number (L-1, L-2, L-3, L-4, and L-5) and all interviewees are identified as being in one of four overarching categories: *library staff member* (n=5; those working at the frontlines directly with library patrons), *program administrator* (n=6; those responsible for implementation of the TIPL program at the library), *healthcare provider* (n=1; those providing healthcare services to TIPL patients), and *healthcare administrator* (n=2; those responsible for implementation of the TIPL program at a healthcare partner site).

Case Studies

Brief case studies are outlined that provide an overview of each program. Specific implementation characteristics of each case are identified in Table 1.

*L-1*

 The L-1 program implemented telemedicine in three, independent rural libraries in the Mid-Atlantic U.S. Implementation included collaboration with a regional healthcare system that provides healthcare professionals (nurses, medical assistants) who operate periodic clinics at each location. Patrons who did not receive care from the system were also able to schedule an appointment in the library through an online system or by calling the library. Funding for the initiative was provided through a mix of public and private sources which were used for marketing, equipment, free-standing private kiosks and staff.

Each library was equipped with one kiosk and a computer tablet. Employees called “navigators” were hired specifically to schedule and manage the kiosks and assist patrons with using technology as needed. Kiosk use was not limited to telemedicine appointments. Patrons were also able to use the kiosk for a range of social services visits requiring a private virtual connection, such as speaking with an attorney, social worker, or employment specialist. Use of the kiosks for telemedicine was not limited to any specialized patient group.

The L-1 telemedicine program was launched in conjunction with a device loaning initiative, in which library patrons could loan out a tablet or Wi-Fi hotspot similar to how they would a library book. The devices were branded with resources that connected library patrons back to the telehealth kiosks should a patron want to schedule a virtual visit with a clinician or social worker.

*L-2*

 The L-2 program was implemented in one standalone rural library in the Southwestern U.S. Project leaders initiated a partnership with a local health science center through which patients could schedule appointments. Library patrons could also make an appointment through the library to use the technology to visit with their own, external care provider. The program administrator applied for and received one external grant to fund the program which was used to purchase equipment (a dedicated computer, bright lighting, and healthcare equipment) and upgrade the broadband systems.

 The library dedicated one space for telemedicine, renovating a storage closet with sound absorbing panels. Patrons were afforded a private entrance to access the telemedicine room. Two days each week were dedicated to patients who scheduled appointments through the healthcare partner, and the other days were available for other patients. Use of the space was limited to those needing a telemedicine visit, but there were no limitations on the types of healthcare visits that the space could be used for.

*L-3*

The L-3 program was implemented in one Northeastern U.S. rural library as part of a 42- library collaboration between a three-county library consortium and a statewide non-profit organization that advocated for senior citizen’s health and healthcare needs. No partnerships were established between the L-3 library and healthcare providers; instead, interested patrons were directed to contact the library if a space was needed for their telemedicine visit. No funding was obtained for program implementation.

The library identified three private rooms located on the top floor of a 3-story building as available for patrons needing space for a private telemedicine visit. The library also could lend one of their laptops as needed. Although the program was marketed through an agency serving senior citizens, there were no stated limitations on the age or types of healthcare visits that the space could be used for.

*L-4*

 The L-4 program was implemented in three rural brick-and-mortar libraries and one mobile library in the Southeastern U.S. The program was developed as part of a study overseen by an area university professor in response to prior research indicating that rural underserved women perceived public libraries as accessible and private locations where they could receive needed healthcare services. The professor leading the study had established partnerships with physicians providing women’s mental and physical health services from the university’s affiliated hospital. As such, women enrolled in the study had access to telehealth services from the physicians, as well as in-person referrals. A community healthcare worker (CWH) provided wrap-around services to women participating in the study, including health education and navigation of community and social services. Funding from the university covered the salary of the CHW.

Each library had a private soundproof room set aside for women participating in the study. People not participating in the study were able to use the telehealth services in the library, including other library rooms when available, but were not eligible to use the rooms set aside for the study. The mobile library was also outfitted for telehealth visits.

*L-5*

 The L-5 program was implemented in one Midwestern urban library that was part of an 18-library (otherwise predominantly rural) county-wide system. Telemedicine was only implemented in the downtown branch of the medium-sized metropolitan area in September of 2020 in response to a stated need from an agency responsible for coordinating alcohol, drug addiction and mental health services in the county when many providers switched exclusively to telemedicine visits at the onset of the pandemic. Ultimately the program coordinated with four mental health organizations to implement telemedicine visits for patients to continue care during the pandemic.

The library had several rooms, one of which was taken out of inventory and used only for telemedicine visits. Only mental health care patients with appointments from one of the fours partner were eligible for the program. The library did not receive external funding, instead using funding from its standard operating budget to fund this initiative. The program ended in late spring of 2021.

Adoption

*Characteristics of Settings*

At the time of data collection, we found five libraries or library systems that were actively implementing TIPL. **Table 2** presents the geographic characteristics of each library. The libraries were in different regions across the U.S. One was an urban library and four were located in rural areas.

*Reasons for Adoption*

 Although each TIPL program emerged in the early days of the pandemic, most early adopters had begun thinking about and planning for the program prior to COVID-19 as a mechanism for responding to extant community needs. A staff member from L-3 recalled that before the pandemic onset, “One of our staff people came in and said she had a friend who needed to do a telemedicine appointment and she didn’t have the resources to do it at home… she asked our director if they could come in and use a room and laptop, and, of course, we made that available to her…We thought ‘well, there’s a real need for this then in the community.’” A program administrator who directed implementation of the program at L-4 reported that the need had emerged through prior research they had conducted with women in the community: “We found that women wanted this service and they wanted it at the library, and this was particularly relevant in rural communities because they wanted it to be private and confidential.” They added that when people did not have transportation, TIPL improved access. “[Some patients] do not have transportation, [and the provider’s office is] too far to walk, so putting an access point in their community center really gives them an opportunity to access care.” A library staff member who worked with the L-2 program described how the program emerged from their existing community-based programming: “It came from a want to expand on this idea of wraparound services for our patrons… we've been doing social service-esque [sic] work pretty much since the ‘08-’09 jobs crisis and putting jobs centers in libraries…we saw the success of that because libraries tend to be a meeting place for some of the most underserved members of the community.”

Once the pandemic started, these programs quickly developed in response to community members’ requests. The library director at L-2 stated, “When COVID started, because so many people depend on us for internet, we've stayed open throughout the whole pandemic and we started getting people who said that their doctors needed to have an appointment with them but did not want the people to come into the office and could they do it from home and the people said no, they couldn't do it from home but would call us and ask if they could come to the library.” A program administrator working with the L-4 program explained that TIPL addressed widening health disparities resulting from the pandemic. “COVID has really made healthcare disparities particularly pronounced, especially among women and particularly among women in rural areas and women of color …women have been really disproportionately affected by unemployment during the pandemic and [have] challenges with childcare. [TIPL allows the ability] to go to the public library, without having to arrange childcare and travel far from your house.” Helping parents of young children with the ability to connect to a telemedicine visit was also reported by a healthcare administrator associated with the implementation at L-1. “It really helps patients that are working… [at home and] have young kids at home…Being able to have virtual appointments has made a huge difference.”

Implementation

*Funding*

As indicated in Table 2, three of the 5 programs (L-1, L-2, and L-4) received grant funding. Participants indicated a wide range of funds received, and some described amounts received from specific grants. For example, those working with the L-2 program described a $20,000 federal grant, while a library administrator from L-1 described the program being the recipient of several grants from a variety of sources, totally nearly $700,000. A healthcare executive working with the L-2 program described the sufficiency of the small grant. “It’s just a matter of purchasing the appropriate equipment and that is what that grant provided, and honestly that grant was very small. It doesn’t take that much...the biggest investment from the health science center has been our time and talents.” A program administrator working with the L-4 program explained that their funding came through a research grant from a local university that “was looking to funding innovative telehealth projects.” The amount of the grant was not described, but the program administrator indicated that the funding was just enough to cover the salary of one CHW. The remaining two programs (L3 and L5) did not report seeking or receiving any funding to support their programs.

*Marketing the Program*

The TIPL program at L-1 promoted the program widely using a variety of mechanisms including billboards, radio spots and tabling at community and events. One library staff member also explained their attempts to reach populations that might miss traditional marketing efforts, including “reaching out [through] Spanish radio…trying to reach out to churches.”

Those programs partnering with healthcare providers used these connections to promote the service directly to patients. A library administrator at the L-1 program described, “Providers are aware of this, so if they see somebody who has limitations to drive two hours to their hospital and they live in [one of three rural areas], they can go to the kiosk.” The library administrator at L-5 mainly relied on providers to promote the program. “We organized the media releases, but then it was up to [providers] to do the scheduling for their clients. So we kind of did the overarching public work, but we did not produce any brochures or anything to tell people it was there…we just didn't feel it was necessary.”

Other programs used all low- or no-cost grass roots measures to market the program to community members. The library director at L-2 described a range of efforts they undertook to reach populations who did not use social media. “If a lot of people don't have internet, then it's hard to reach some of the people that need it the most. We put flyers at the pharmacy, flyers at the post office, word of mouth, email, that kind of thing. And actually, I have gone door to door, and just taped some of our flyers to, in the low-income housing, taped the flyers to the door.” The library administrator at L-3 reported they used local channels to share the program with patrons. “I do all the promotion [for the program]. I took the information and wrote some newspaper articles. We also have our own webpage that I advertised on, as well as, we have an Instagram page and a Facebook page…We [promoted it on our] public access channel. [because] I find that a lot of people will have that running during the day because it plays music, and they watch the slides as they come up.”

*Staffing the Program*

The two programs that included broader social wrap-around services (L-1 and L-4) hired additional staff to support the program; the other three did not. At theL- 4program,they hired “a full-time CHW. She moves around… to physical library branches four days a week in the rural low country and then one day a week we have a mobile library and so she's able to take that mobile library out to even more rural locations that don't even have a library branch.” The L-1 program also utilized additional staff who helped manage the kiosks and help patrons navigate unfamiliar systems. “We have a [navigator] that will come out to help them work with the technology and get them set up so that way they can have their appointment, and they’ll teach [patrons] how to use it… [This person] travels out to the different library sites or the different access points to help the patients with the technology.”

 Although the L-5 program did not hire extra staff, they partnered with local agencies to train existing staff in mental health issues. “We made sure that all of our staff that were working in that area got ‘Mental Health 101’ training that we also did through our Alcohol, Drug Addiction and Mental Health Services Board…We just want to make sure all those staff that were working in that area knew some of the signs and symptoms to look for.”

 Whether or not additional staff were hired for the program, an identified role across all TIPL programs was to support telemedicine patrons use of the technology. This was seen as particularly critical when the clientele lacked digital literacy or skill. A library staff member at L-1 described how the navigator met this need: “Most…patrons are elderly… they don't know how to either use [a laptop or tablet].” In addition to having staff support patrons connecting to a Zoom or Webex link, the program administrator from L-5 described how staff posted written instructions to patrons trying to connect to specific providers. The instructions guided the user through how to connect to each individual provider. “We did a poster in the room…[for] each day of the week. It said, ‘okay if you're here with [specific healthcare provider] on Tuesday, this is how you're going to connect up: They use Zoom, they're going to send you a text message with your Zoom link or an email. If you need help getting your email or whatever, let us know. And each day we had the details, or if you have trouble with [reaching the healthcare provider] here's the phone number you call.’”

*Equipment and Software*

Equipment to support telemedicine was minimal, and mainly limited to establishing broadband and ensuring patients had access to a laptop or tablet to connect. A healthcare administrator from a regional system that collaborated with L-2 noted, “All the tough work was establishing broadband, that’s the biggest piece.” Similarly, the program administrator working with the L-4 program explained, “All you need is… an internet connection and a laptop and that's it.” The program administrator working with the L-3 program noted that three existing laptops were able to be loaned out for the program, requiring no additional purchases. They noted that if a provider preferred to call a patient on the phone, “I'm sure staff would have said use my phone, have them call my phone and you can use it.” The library’s equipment was sometimes pre-loaded with telemedicine apps commonly used by local providers, although this was not always sufficient. According to a program administrator at L-5, “We had one provider that had a proprietary software, so we had to download that software onto that computer so that those folks could get in.” The L-5 program had one laptop dedicated to the service, and unlike other programs also had “a landline phone that could make outgoing calls only, not incoming. We heard from a lot of the providers … that a lot of the problem was just having phone for [patients to call their provider].”

Two of the programs offered the use of healthcare equipment. The L-1 program allowed patients to check out blood pressure cuffs from their circulation desk that they could take home for up to 3 weeks. The program administrator at the L-2 program also reported having a variety of equipment available in their telehealth room, including “pulse oximeters, blood pressure cuffs, scales, gloves, rubber gloves, thermometers.”

*Private Space*

All of the programs afforded patient privacy by giving patrons a private space for their visit. Three of those programs (L-3, L-4, and L-5) used existing meeting rooms, while the other programs had unique solutions to create private space. The L-5 program dedicated one room to telehealth visits, making it unavailable to other programs. According to the library administrator, “We put signage on the room that said, this is reserved space. We did not say what it was reserved for because we didn't want any stigma associated with the patient that might be sitting in the room, we just said it was reserved space.” In addition to private rooms allocated in libraries associated with the L-4 program, their mobile library was equipped for telemedicine visits. Having a mobile telehealth space was instrumental in addressing the small footprint rural libraries. According to the program administrator, “we have been able to take the mobile library to the bricks and mortar building so that we're not taking space away from the library if they have events or if our private room is booked.” The program used a creative way to take advantage of the limited hours that is typical of many rural libraries. “One of our libraries is, is really small and so there [is no] private room, but it's also only open in the afternoons and so we've been able to do morning appointments at the bricks and mortar building so we're the only people there.”

Because of limited private space, the L-2 program needed a unique solution to accommodate the library’s layout. According to the program administrator, “We’re basically one large room. This library is about 3,500 square feet…My office was one private space, so [originally] we would put them in my office. [Our grant allowed us to] set up this room I'm in now. It was a junk room, storage room…[it] has no cross ventilation with the rest of the building.” They noted that privacy was also afforded by directing patients through a separate entrance. “The only way someone would know that another individual is coming into for a telehealth visit is that they would’ve seen their automobile or their bicycle or would’ve seen them come in from the very back of the library into a room, doing their visit, and leaving.” A healthcare administrator with the program explained why they went so far to create a sense of privacy. “We got to create an environment where there is psychological safety and what does that mean to each individual, and I think it varies. Some people are like, ‘I don’t care as long as people don’t know my business, I don’t care if you see me going into that room,” versus, “I don’t want anyone to know, and I want to talk to my counselor and I want it to be soundproof, and if I want to ball out my eyes and cry, I want to be able to do that.’”

Instead of allocating an existing room, one program (L-1) outfitted each of their three TIPL libraries with a free-standing kiosk equipped with a tablet. A library staff member described the kiosks as, “very small… there's a door… it's very confidential. There's white noise that I can play outside [if] they don't feel [privacy is] 100%.”

*Cleaning protocols*

Three of the libraries described cleaning procedures. The L-2 program administrator explained why a disinfection protocol developed by their health system partner was important to ensure buy-in from librarians: “Pushback from other libraries was they didn't want to be encouraging people who were contagious to come to the library…Disinfection teams at the [health system partner]… provided the disinfection liquid or, you know, and the whole protocol of here's what you do and here's how long you leave it on.” Similarly, the library administrator with the L-5 program described their protocol. “We wiped the computers, we sanitized everything, and then left the room and there was always at least 15 minutes in between each appointment so we could do that.” Cleaning of the kiosks at L-1 was done through a simple system of ultraviolet lights. One library staff member explained, “The kiosk is self-cleaning…it has UV light. After every visit I'm going to clean it. [It’s] just it's two clicks of a button, it takes 11 minutes. The UV light in it itself cleans everything.”

*Scheduling the space*

Three of the programs discussed protocols for scheduling appointments: As part of a walk-in only program, there was no new scheduling protocols involved in the L-3 program. The program administrator working with the L-5 program discussed how they developed their scheduling system in collaboration with their healthcare partners. “We ended up landing on four partners and those four partners each had a day of the week. [All of the healthcare partners] agreed on time slots, so that each of those four days the time slots would be consistent. So [at] each individual organization, their schedulers knew what the time slots were for their day at the library, and they managed the scheduling.”

The L-2 program administrator explained how privacy was maintained during appointment scheduling. “When people want an appointment, they call the [healthcare partner to] schedule the appointment… All the [healthcare partner] tells me is ‘you will have an appointment at 11 o'clock tomorrow.’ They don't give me a name, they don't tell me what the appointment is about, so it's, the privacy is protected.”

A library staff member working with the L-1 program explained that in addition to scheduling appointments through their providers, library patrons had the ability to schedule a time in the kiosk [for any of their services including telemedicine] through an online system, but few of them used that system. “They usually call me again because most of the patrons I that deal with are older and they don't really know how to use technology.” However, with kiosk appointments scheduled at frequent intervals, a library staff member at L-1 determined that procedures for scheduling appointments through provider offices needed adjustment because of the time it took some patients to determine how to connect to their provider. “One of the patrons in fact, by the time she figured out how to get on the [telemedicine] system…she missed her appointment. [There needs to be] clear instructions…from the doctor’s end and to tell people to get on 15 minutes earlier so that they can you know download anything they need to or… to give them enough front time to actually get online, get set up, especially if they're not accustomed to using that stuff.”

**Maintenance**

 At the time of data collection, only 4 library or library systems were still running their TIPL programs. The program administrator at L-5 explained that they had stopped the program in late spring of 2021, when many libraries began to re-open their doors. “[Ending the program] coincided with demand for our library spaces [which had] increased so much that our team was missing that room, and our main library branch manager… said ‘you know, we increasingly need that room because we're out of space and I'm noticing it's empty more.’” As of the writing of this manuscript, the remaining four programs were still offering TIPL programs.

 Despite remaining open, the other four programs had limited uptake of people using the library for telemedicine. At the time of the interview, the program administrator working with the L-3 program reported no patrons having yet used the service, stating, “We have had no one contact us at all.” The program administrator from the L-2 program estimated having 15-20 appointments in the library since they had originally opened. “It's been severely…underutilized and I am still trying to kind of tease out the reasoning for that, and the solutions for that.” The L-1 program had many patrons using the kiosks, but it was not clear how many of them used the kiosks for telemedicine appointments versus other services.

 The programs that remain open reported continuing to try to understand how to reach more populations. A healthcare administrator working with the L-1 program described the urgency for connecting to underserved populations. “We need to figure it out moving forward: how do we bridge that gap to really drive folks to really use the services?” The program administrator from L-3 reported continuing to promote the service, despite having had no patrons yet. And the library administrator from L-2 reported writing more grants to fund the service across the region. “I am in the process right now of a pending USDA grant…to take these programs into a neighboring county…[where] we're working with two different libraries there to help them establish telehealth and aging in place programs.”

**Discussion**

This research demonstrated that innovators of TIPL programs represent a wide variety of programs and structures. For example, each program was launched using a different organizational structure. Two of the libraries were part of larger systems, while the other three were independent libraries. Interestingly, two of the programs that launched in independent libraries both had a coordinating body: L-1 was coordinated by its state library and L-3 was coordinated by an independent state agency. However, the amount of coordination of the L-1 program was significantly higher, establishing a partnership with a regional healthcare provider, obtaining funding to support the program, and taking the lead on implementation of the service, while the coordination of the L-3 program appeared confined to advertising on the agency’s webpage. Given that L-3 program was the only program that did not have a healthcare partner, this lack of coordination may have been largely responsible the fact that the L-3 program had not yet heard from patrons wishing to use the library for telemedicine when we interviewed them in 2021.

While we do not have official numbers of patrons that each program connected with a telemedicine visit, our study suggests that largely TIPL was not well utilized during its initial rollout. Slow uptake is not unusual in the initial phases of new program (Rogers 2003); however, it is reasonable to expect that libraries may view lack of patron enthusiasm as a reason not to invest in this programming. As such, it is important to analyze potential barriers to patron uptake. A likely limitation is that many of the people who would benefit from this programming, i.e., those with limited access to broadband, consequently had limited opportunities to learn about local TIPL programs. All programs we studied were implemented during the first year of the COVID-19 pandemic, when people were avoiding travel outside the home. Thus, patrons who typically relied on face-to-face interactions to learn about new programming were limited in their exposure to the information. Further, our study findings suggest that having a healthcare partner and centering marketing efforts through a provider’s office may be more impactful to driving attendance than traditional marketing of other library programs. As such, the coordination of services through a provider office may be more important to program utilization than high levels of program funding. The L-5 program received no money from external funding yet had a steady stream of patrons utilizing the TIPL program during a time when providers were only seeing patients over telemedicine. Thus, a program that is highly coordinated with a dedicated healthcare provider partnership can be successful with no external funding when the need from the community is great. Still, programs with considerable funding were able to deploy staff that could drive program attendance. The L-1 program hired navigators who assisted patients, and they also sent staff to attend community health fairs; the L-4 program funded a community health worker who worked with patients and could offer the telemedicine visits as an option to support community women encountered in the larger program. Thus, depending on the goals for the program, hiring people to created trusted connections into the community may be a critical component. With COVID lockdowns now seemingly in the past, it will be important to study trends in use of TIPL programs by community members, and more systematically explore use and barriers to uptake.

Our study highlighted that even in the early days of the COVID-19 pandemic, TIPL was not confined to one region of the U.S. but was happening nationwide. Further, it appears that, although the majority of the programs we studied served rural communities, urban programs were also developed. Indeed, it appears that libraries responded to the needs of those who were both medically and digitally underserved in their communities. However, only one urban program we studied offered telemedicine visits in the library, and this one closed within several months of its initiation. Limited early implementation in urban settings suggests that going forward, this model may be offered predominately in rural libraries, although our limited sample makes it difficult to draw these conclusions. Greater access to digital signals (i.e., cellular, broadband) in urban and suburban communities may drive libraries working to improve access to digitally marginalized populations to work with patrons to provide education and equipment to connect in their own homes, rather than offering library space for them to connect. This is already being reflected in new programs that have emerged since our study. For example, the Nashville Public Library was recently recognized for a program providing education and equipment to older citizens, to enable them to connect to a telemedicine visit from home (Brown 2022).

Implementation Guidance

In addition to helping potential adopters of TIPL understand the money and partnerships needed to successfully launch a successful program, experiences of these early adopters can help guide practical decisions, such as how ensuring patient privacy and standardizing the development of procedures. In particular, standardized procedures for establishing privacy, cleaning, and scheduling can be utilized broadly and customized for specific programs.

Deciding how to accommodate adequate space for patients to experience a private telemedicine visit is a critical component to developing a telemedicine program in a library and may require the most preparation. One of the programs in our research used freestanding, soundproof kiosks to ensure privacy; however, this solution will not work for programs where the footprint of the library is too small to accommodate even a modest kiosk. Similarly, those small libraries may lack a private meeting room, or in other cases, opening a room for this purpose may cause the library to bear increased costs to heat and cool the room (DeGuzman et al. 2021). The L-2 program renovated a storage closet, but this solution can come with downsides as well: there are costs involved in renovation, and the library has fewer closet space to store essential equipment and supplies. Solutions may require support of one’s board of directors or grants to raise additional funds to offset these new costs, which can range as high as $7500 for an individual kiosk.

 The question of privacy is not limited to space. Although libraries are not healthcare providers and thus may not be subject to the Healthcare Portability and Accountability Act, librarians are concerned about their liability with regard to privacy (DeGuzman et al. 2021). A standardized form explaining the limits of privacy available in the library may help libraries and their boards gain comfort with this practice. Although not discussed by our interviewees, we have since learned of waivers that some libraries around the county are utilizing to explain privacy limitations to patrons.

Severalof the libraries we studied described having developed procedures for cleaning and scheduling of visits. Despite a degree of variability intrinsic in the specific differences between programs, several areas exist where procedure standards or templates could be developed and made available to libraries wishing to implement this programming. Standardized cleaning procedures can include suggestions for solvents or UV lighting, and mechanisms for cleaning both space and wiping memory from computers or tablets in between visits. While scheduling visits will likely be done in coordination with a library, in the absence of dedicated staff, standardizing directions aimed at helping patrons connect to a visit (such as described by the L-5 program director) may be useful.

 Overall, documenting procedures can help support partnerships between libraries and providers, or individual libraries and a state library or other coordinating body. Documenting these procedures in a memorandum of understanding or other standardized format may support with planning, communication and buy-in among various agencies.

Expanding Telemedicine Access: Next Steps

Our research has highlighted the work of the earliest adopters of TIPL, in an effort to define the current state of program implementation and identify future needs that will support further innovation. As the COVID-19 pandemic eases from a public health emergency into a global endemic, we may expect to see some changes that will impact this programming. Reimbursement policy changes are among the most significant that would impact the ability of U.S. patients to conduct a telemedicine visit in their home. While at the time of the writing of this paper, Medicare (federally provided health insurance for all adults 65 years of age and older) still allows providers to be paid regardless of the location from which patients connect, this is not universally the case for all insurance providers, even for other government-sponsored programs. For example, Medicaid programs are administered by individual states to provide health insurance for those living in poverty, but each state provides different coverage and many programs do not reimburse providers for home-based telemedicine visits (Center for Connected Health Policy, The National Telehealth Policy Resource Center, and Public Health Institute 2022). As such, policy makers are urging development and maintenance of broad reaching policies for supporting reimbursement for telemedicine originating from locations that already serve marginalized populations (such as libraries and community centers; Khoong 2022).

In addition to continuing to study the implementation of TIPL programs as they continue to emerge across the country, supporting post-pandemic policies that allow continued reimbursement for providers whose patients connect from a library will be supported by research studying patient-level outcomes. In particular, research is urgently needed that evaluates and documents the impact of library-based telemedicine visits on patient health outcomes. Outcomes that can be studied included missed or cancelled appointments, distance travelled, perception of visit quality, and health outcomes for specific population, such as Hemoglobin A1C for diabetic patients or blood pressure for those with hypertension.

Finally, our experience with interviewing implementers of TIPL sheds light on the difficulty connecting with vulnerable communities. The original impetus of each program revolved around supporting those with limited ability to access health and social services. However, only two programs were actively addressing specific populations’ identified needs. Programs wishing to serve vulnerable communities may be best served by conducting a community assessment to determine health service needs prior tolaunching TIPL. Such an assessment could be done in collaboration with a community-serving agency such as a state- or regional-level rural health, senior health, or mental health agency, and would include information to help identify the populations most in need of services.

Limitations

This is a qualitative research study and thus is meant to be informative, but not generalizable. Our sample was limited to those programs we had heard of either through the media or word of mouth, and likely does not include all TIPL programs that had been implemented when we conducted our research. As such, our findings likely do not represent a comprehensive view of all innovators, and findings should be interpreted with caution. Further, due to the few early adopters of TIPL, our research did not have a large enough sample size to make any inferences about differences between groups, such as between healthcare providers and librarians. To further flesh out these differences, researchers can use these findings to design larger quantitative surveys that would better inform the differences in perspectives between stakeholder groups.

Conclusions

The first programs to initiate telemedicine in public libraries offer several insights to others wishing to consider this programming. While a library of any size or with limited resources can begin a program, a coordinated partnership between libraries, the communities they serve, and regional healthcare providers will likely offer the most benefit to community members who are limited in their ability to reach their providers over a telemedicine connection from their home. Future research should evaluate the impact of these programs on patient outcomes, which will arm policy makers with data supporting the continued reimbursement of telemedicine visits from community locations.

**Figure Legend**

Figure 1: Interview Guide for Library Directors, Librarians and Library Staff.

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