Barriers to Meaningful Connectivity: Exploring Internet Access Options in a Low-Income Urban Neighbourhood

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Abstract

Community networks risk failure when they attempt to emulate models from elsewhere without engaging the community in the process and making appropriate adaptations. These 'build it and they will come' models rarely work over the long term. This research project explored claims from residents of a low-income neighbourhood in the "North End" of Winnipeg in Manitoba, Canada, that inadequate and unaffordable Internet connectivity limits their access to critical communication tools, resources, and information. Through the research, we identified the need for a sustainable model of affordable, accessible Internet connectivity that centers on building a cooperative-owned and operated community network with Indigenous and newcomer families at its heart. Findings revealed that high connectivity costs, limited digital literacy, and inadequate infrastructure are the primary barriers to meaningful connectivity in the community.

The intent of the "North End Connect" research project was to work directly with the residents, to learn about their connectivity needs and wants, inform the project's technical team as to how and where to build a solution that works for the community, removing explicit and implicit barriers to access. Through our research, we validated that digital connectivity is a problem in the community. Utilizing a CBPAR approach provided a more nuanced understanding of the barriers to access from the resident's perspective and lived experience. This allowed for the development of a strengths-based roadmap that utilized existing assets to provide affordable, accessible, trustworthy, and secure Internet access to anyone who wants it. The research acted as the catalyst to motivate the community and led to ongoing interventions aimed at addressing each of the identified barriers. As we investigate these barriers, it becomes evident that addressing these issues is not just a matter of technological access but a crucial step toward fostering a more inclusive and equitable society. The project serves as a model for community-driven digital inclusion efforts and contributes to global conversations about equitable access to the internet.

Keywords: *digital inclusion; digital equity; meaningful connectivity; social justice; community networks; poverty alleviation, transformative change.*

Introduction

Digital exclusion, often referred to as the 'digital divide' (Greene, 2021), has become a widespread and growing issue that significantly impacts people's quality of life, educational opportunities, and employment prospects (Tongia & Wilson, 2011). The digital divide is defined as "the inequity of access to digital technologies, especially Internet access, reflecting economic and social disparities between segments of society or between nations" (Connect Humanity, 2022, p. 5). This divide is particularly evident in marginalized communities, including the North End of Winnipeg, Manitoba, Canada. The North End, specifically within the "R2W" forward sortation area (FSA) of the postal code, has faced systemic neglect in both economic investment and digital infrastructure, leaving residents with limited access to reliable Internet services despite being an urban capital city of approximately three-quarters of a million people, areas with lower income and less education experience inferior service at the same high cost as more affluent areas (Mersereau, 2021).

Historically a working-class immigrant neighbourhood, the North End has experienced decades of disinvestment, exacerbated by racist stereotypes and economic challenges. As manufacturing businesses left the area post-World War II, property values declined, and banks and government services withdrew, leaving the neighbourhood economically marginalized. This lack of economic opportunity extended into the digital realm, a phenomenon known as "digital redlining," where telecommunications companies avoid upgrading infrastructure in low-income areas (Friedline et al., 2020). The result is a disparity in Internet access, with older, unreliable infrastructure leading to poor connectivity.
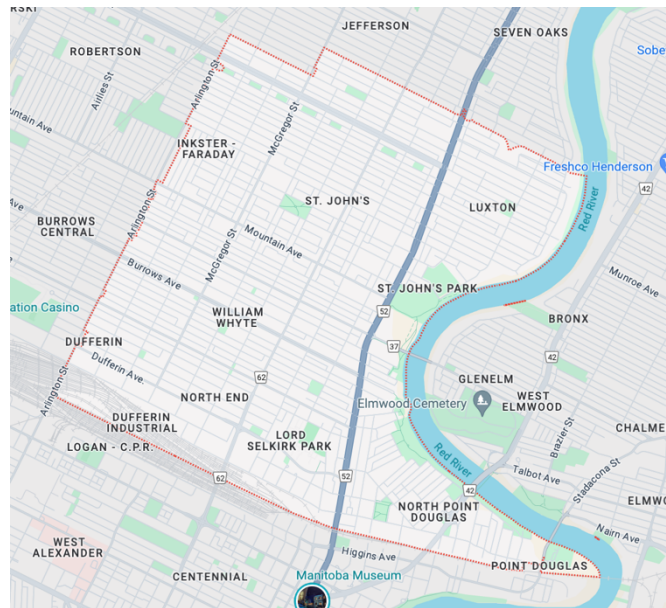
The situation became even more dire during the COVID-19 pandemic. Prior to the pandemic, residents of the North End relied on public spaces such as libraries and community centres for their digital needs. However, health restrictions closed these vital community hubs, leaving residents isolated from essential services and educational opportunities. The pandemic highlighted and deepened the existing digital inequities, as many residents lacked the devices, skills, and connectivity needed to work, learn, or access social services online at home. Unlike more affluent areas where digital access mitigated the impact of the lockdowns, the North End's lack of resources left residents at a distinct and increased disadvantage (Buchnea et al., 2020).

Recognizing the urgent need for digital inclusion, the Internet Society Manitoba Chapter, in partnership with Indigenous Vision for the North End, Computers for Schools Manitoba, and Broadband Communications North, overseen by the University of Winnipeg with financial support from the Manitoba Research Alliance, launched the "North End Connect" project in 2020. This project aimed to address the barriers to Internet access in the area through a community-based participatory action research (CBPAR) approach (Baskerville et al., 1996). The insights gathered from this research revealed that government programs, such as the "Connecting Families" initiative, were insufficient in addressing the specific needs of North End residents, particularly those without permanent addresses or with poor credit. Additionally, access to affordable connectivity does not solve the issue of inadequate devices, limited digital literacy, or the need for technical support (A4AI, 2022).

This research served to understand the problem, explore options, and support the feasibility of taking local action. The North End Connect project strives to build sustainable and practical solutions for the community. This article will explore the lessons learned from the residents of Winnipeg's North End and discuss the necessary actions to overcome the barriers to meaningful digital connectivity. By contributing to the growing body of research on digital inclusion in low-income urban areas, this work highlights the critical role of community-led initiatives in bridging the digital divide.

Literature Review

The existing literature on meaningful connectivity focuses on the intersection of Internet deregulation, commoditization, and social exclusion, particularly in the context of communities facing poverty. It emphasizes the discrepancy between the political rhetoric promoting universal Internet access and the current reality, where technology is perceived as a tool for profit rather than a means to guarantee essential needs. Terms like digital divide are catchy and appropriate, but far too vague to inform possible solutions to bridge said divide. The term meaningful connectivity, though itself far from perfect, insists that the focus shouldn't only be on access, but rather on the uses and value derived by the end user. Tarnoff states, "an Internet run for profit is one that can't guarantee people the things they need to lead self-determined lives" (2022, p. xii). The COVID-19 pandemic highlighted the crucial role of Internet connectivity, positioning it as a necessity akin to water and electricity (Abdelaal et al., 2022) and a human right according to the United Nations[1] (Szoszkiewicz, 2018; U.N. General Assembly, 2016; Reglitz, 2020).

The argument for digital equity is presented, emphasizing the need to separate technology from financial constraints and prioritize citizens over corporations (Tarnoff, 2022; Barendregt et al., 2022). In the current context, the Canadian regulatory framework favors public/private partnerships over community or municipal networks. This hinders the ability of

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[1] UN General Assembly, The promotion, protection and enjoyment of human rights on the Internet, 27 June 2016, A/HRC/32/L.20.

community-based organizations to address power imbalances in the telecommunications market. Many scholars have called for renewed attention to vulnerable and marginalized communities (Abdelaal et al., 2022; McMahon et al., 2020; Barendregt et al., 2021; Wylie et al., 2021; Lingel, 2021; Weeden et al., 2020; Nowak, 2023).

Research in digital equity suggests that the current Internet access model is beyond reform, driven by a business culture focused on consolidating control and eliminating competitors. It delves into the political nature of the Internet, emphasizing its role in relationships of control. Many scholars critique the political rhetoric regarding access for framing poverty as a problem of performance rather than acknowledging structural issues (Abdelaal et al., 2022; McMahon et al., 2020; Barendregt et al., 2021; Wylie et al., 2021; Lingel, 2021; Weeden et al., 2020; Nowak, 2023; Greene, 2021). These scholars argue that this view pushes the responsibility for unaffordability from the telecommunication oligopoly to the end users.

Practitioners of digital equity argue that governments have been co-opted to serve powerful telecommunications providers, neglecting policies that benefit Canadians irrespective of income, education, ethnicity, culture, or age. Despite limited progress over decades of effort (Weeden et al., 2020), the text generally expresses optimism that the current situation is not inevitable and can be challenged by building alternate paths to digital connection (Abdelaal et al., 2022; Barendregt et al., 2021; Clement et al., 2012; Lingel, 2021; McMahon et al, 2020).

The digital divide is cyclical, with education and income serving as central predictors of Internet access. Concerns are raised about the fragmented landscape of digital programming in Canada, despite some growth in digital literacy training programs (Abdelaal et al., 2022; Beunte & Robbin, 2008; Goldin & Katz, 2008; Hale, Cotton, Drentea, & Goldner, 2010 as cited in Haight et al., 2014, p. 506). Too often, effort and funding fall short when they are managed in a piecemeal fashion, and funders prioritize quantity over quality as the indicator of the impact of their programs. The significance of a single intervention may be several times more impactful for low-income individuals, but rarely is this taken into consideration when statistics are collected and evaluated by funders.

The research underscores the exacerbated inequality among Indigenous and newcomer families living in poverty, emphasizing the importance of distinguishing between "access to" and "actually has and utilizes" broadband. Referred to as "effective use" (Gurstein, 2007), active production of knowledge is prized over simply being available. Akin to having access to a road but no car nor licence to drive, the end users' experience is critical to the determination of success, though this is currently not how it is measured. Connectivity is said to exist if a service is available in an area. When even one location reaches the Canadian Radio-Television and Telecommunications Commission (CRTC) standard, everyone in that area is considered "served" (Hambly et al., 2021). This ignores the realities of those who cannot afford the service, do not own appropriate devices to operate online, and lack the skills to navigate the systems adequately or safely (cybersecurity/scams). The subjective and piecemeal approach to the issue is identified as a significant part of the problem, challenging the effectiveness of declaring 100% connectivity

without addressing underlying issues (Abdelaal et al., 2022; Afzal et al., 2022; BDO Canada LLP., 2017; Haight et al., 2014; Mangla et al., 2022; Mora-Rivera, 2021).

> The second half of humanity will not be connected in the same way as the first — by large for-profit incumbent telecommunications companies. While these firms have connected billions of people in the last 25 years, they are meeting their limits. It is simply not in their business models to invest in low-income, often rural, communities that do not offer the profit margins they have come to expect. They have not and will not connect everyone. (Connect Humanity, 2022, p. 5)

The literature validates that the problems and complaints experienced in the North End of Winnipeg are consistent with other similar communities in North America and around the world. Past Community Informatics (CI) project successes support the establishment of a community network project in the neighbourhood. With several models in use now, the project team must experiment with different options and choose those most appropriate and most likely to succeed in accomplishing the goal of ubiquitous access without barriers. Success will be evaluated based on if achieving meaningful connectivity will indeed reduce suffering and provide needed resources and services to everyone who requires or desires them. In this project, transformational change is the goal, not just the building of a computer network. The network is simply a conduit (figuratively and literally) to remove barriers and provide opportunity. The concept of meaningful connectivity is particularly relevant to the North End, where access to technology alone has proven insufficient for equitable participation.

Methods

The team chose the Community-Based Participatory Action Research (CBPAR) approach as this type of complex problem is best explored with those directly impacted by it. Thus, a community-based approach seemed to be the best fit to approach the non-linear realities of digital adoption and use. (Baskerville et al., 1996; Beckinsale et al., 2011; Flicker et al., 2008) The Participatory Action part emerged from not wanting to just identify the problem and recommend solutions but to conduct limited experiments with many options until a transformational change is made. The project scope extended beyond the technical requirements and included the social and financial aspects of the barriers (MacKinnon, 2018). This approach is very common in Community Informatics.

In addition to a literature review and key informant interviews, the research methods included several stages. First, a quantitative review of real-time crowd-sourced Internet Performance Test (IPT) data available through a partnership with the Canadian Internet Registration Authority (CIRA) https://performance.cira.ca/northendconnect was conducted over several months. The IPT is based off the M-Lab platform[2] which makes it uniquely appropriate for this purpose. The objective of this analysis was to find out whether the user

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[2] https://www.measurementlab.net/frequently-asked-questions/

experience in the target area meets the CRTC's definition of acceptable Internet service. It is important to note that the measurement of Internet speeds, the way that governments, providers, and users evaluate Internet performance, is highly controversial and problematic. (Government of British Columbia, 2022) Though we made every effort to be precise, this is at best a baseline and general snapshot of the area and will need longitudinal analysis to improve its quality and meaning. Taking the limitations into consideration, we found that based on these performance tests, user experience does not meet the CRTC definition although the area is considered "fully served" by the CRTC and Innovation, Science and Economic Development Canada (ISED) standards[3]. A summary of this review has been provided in the appendix to this article. The source data and the code used to clean and process the data can be found for review and future re-use in the open-source software repository GitHub at: https://github.com/InternetSocietyManitobaChapter/JupyterNotebook_NorthEndConnect.

Second, in-depth, in-person, community based semi-structured interviews (n=35) over the period of nine months between May 2022 and January 2023 were completed[4]. Interviews were transcribed and thematically coded using qualitative analysis software to identify recurring themes related to connectivity barriers and community needs. This research was funded by the Manitoba Research Alliance and the research methodology was approved by the University of Winnipeg's Human Research Ethics Board. Interviewees were asked about their use of, and experiences with, technology. Where access was limited, the goal was to identify the nuanced barriers as well as the desires of the participants in what they would like to utilize technology for in their daily lives if access was readily available. Effort was taken to inquire about attitudes towards technology as to not assume that more connectivity is automatically the desire and answer for everyone. Questions were purposefully open and did not prejudice a particular technology or brand or service over another.

These approximately 30-minute-long interviews were conducted by two Indigenous women from the neighbourhood, in conjunction with community events held by local service organizations. We learned from our Indigenous advisors that trust is a critical component when doing research with Indigenous peoples. The project team believed it was essential to provide a welcoming engagement in a trusted environment to gain authentic and unfiltered responses. Historically, research on Indigenous communities has proven detrimental to the individuals and/or the community (Castleden et al., 2012). Our partnership with trusted local organizations, and others with shared lived experiences, led to interviews where the participants felt comfortable enough to participate fully. Interviews were transcribed[5] and analyzed thematically using a critical and decolonizing lens[6]. This project leaned heavily on the past successes of the

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[3] https://crtc.gc.ca/eng/Internet/Internet.htm

[5] The interviews were recorded digitally, transcribed using online software, and cleaned manually by a research assistant.

[6] Decolonization requires non-Indigenous Canadians to recognize and accept the reality of Canada's colonial history, accept how that history paralyzed Indigenous Peoples, and how it continues to subjugate Indigenous Peoples. Decolonization requires non-Indigenous individuals, governments, institutions, and organizations to create the space and support for Indigenous Peoples to reclaim all that was taken from them. https://www.ictinc.ca/blog/a-brief-definition-of-decolonization-and-indigenization

CLOUT project conducted in the neighbourhood in past years (MacKinnon, 2018). The project team followed OCAP® principles[7] modified to adapt to the community while still honouring the ideals. Typically, the participants would be part of a First Nation community proper, but as this is a mixed neighbourhood, our partner organization, *Indigenous Vision for the North End,* acted as "owner" and guardian of the data and oversaw the process in conjunction with the ethics board at the University of Winnipeg.

We asked interviewees about their access to and use of the Internet. They were asked about the type and number of devices they used daily or consistently. They were asked about their perceived comfort level and trust in using technology to satisfy their needs. Focus was put on asking what they did or wanted to use the Internet for, what worried them, and in the case of not having access, what barrier(s) prevented them from achieving the connectivity they desired.

Findings

Resident Experiences with Connectivity

The lack of suitable options became evident when speaking with residents who have some connectivity and those who tried but failed to maintain adequate access to the Internet. Many of the participants identified the high cost of connectivity as restrictive or entirely prohibitive. When they paid for home Internet service, they noted the limitation of that service being confined to the home. If they wanted or needed mobile service, that was an additional service with more costs.

Alternatively, some residents only have mobile service and rely on tethering devices like computers and televisions to their phones. Though this technically works, it significantly increases their mobile data usage, especially when that service is supporting additional family members. In Canada, many mobile packages have data limits where, after a given threshold, the bandwidth is severely throttled to near dial-up speeds, rendering the service technically working yet practically useless. This was reported as a common experience among participants who had to make difficult choices regarding their personal spending priorities.

Participants noted that certain factors, such as children's homework or parents' work, required them to have connectivity and that it came as a trade-off of having adequate food, clothing, or other basic necessities. One participant said, "*[Free Wi-Fi is] better because… parents have kids and their kids want [to use the parents'] phones, so better if things go on the Wi-Fi, give the kids the phone and let them, you know, use the phone, then they're not using data… [I]t costs money. If they go over data, that's money being wasted, then data being wasted. You only get a certain amount. You know, certain people get a certain amount a month*" (P-U2)

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[7] The First Nations principles of OCAP® establish how First Nations' data and information will be collected, protected, used, or shared. https://fnigc.ca/ocap-training/

Overall, participants stated that they want the same things as any general user of the Internet. Users wanted access to information for planning and daily decision-making, connection to others with a specific focus on family and close friends, and opportunities for learning new things. Several participants noted access to family and friends to maintain social inclusion, "*every services [sic] that I want right now is done through technology, the systems, it's all everything is up on the Internet. So, if [the Internet went] down, I think we all will be just lost*" (P-37). Parents noted that ubiquitous connectivity would give them oversight of their children's well-being and physical safety. Participants noted that many resources and services, such as businesses and government/community programming, moved online during the pandemic. These services have not, and likely will not, return to in-person. Many places that had shared computer labs closed and did not reopen. These factors further reduced the opportunities for residents and put an additional burden on them to find or fund alternate solutions.

A theme that emerged when interviewing residents who did not have home connectivity or mobile access was the excessive and unnecessary amount of time and effort that they spent to achieve even the most limited connectivity. Places such as libraries and community service organizations provide limited access to technology such as computers, printers, fax machines, or telephones. Though these services are typically free or very inexpensive, they come at the cost of personal time, effort, and inconsistency. Factors such as travel time, time away from work or home, cost of bussing or other transport, and childcare, all accumulate and add to the burden of the end user.

In cases where devices are limited, users often wait for long and unknown periods to complete simple tasks such as checking emails or looking up basic information. One community worker interviewed noted that participants of post-prison work-release programs often do not have their own phone number and when they use the number of the program office, prospective employers look up the number and discriminate against the participants. Another participant highlighted the limited number of free Internet access points in the neighbourhood and specifically noted that in some places like chain restaurants, some users are kicked out for loitering whereas others are not. The participant suggested that this discrimination was based on racism and prejudice because it happened disproportionally to Indigenous people, newcomers, and homeless persons. The literature and security experts we interviewed noted that hotspots provided at no cost by telecoms/ISPs would require a valid email address and other personal information to authenticate the user. These data are often collected and sold by corporations who solicit marketers looking to target users with advertisements (Zuboff, 2015). As one interview participant stated:

> "*…the only concerns I have is the security. Who knows, I could use this Internet connection and might get hacked or exposed to hackers and steal my data so that's a concern. I think that there should be some sort of security guarantees for those who are using free Wi-Fi in public places.*" (P-36)

Security Concerns and Exploitative Practices

In one specific case in the North End, an ISP deployed hotspots that would work for customers of their company, and a "free" option for non-customers, that had an option to receive promotional emails and other marketing services. This option had a check box for the user, and if the option was not agreed to, the user could not connect. Free Internet options such as this, and the often long and confusing content of user agreements, remove user agency, with the result that the user isn't consenting, but relenting (Templeman, 2022). "*I know it's insecure… we want to avoid it, but we cannot because all the services are dependent on technology*" (P-37). No cost Public Access Points "Hot Spots" are an efficient and flexible method to provide access, but having to provide personal data act as hidden exploitations of the poor.

Participants' concerns about Internet access also reflected common issues that any Internet user might worry about. They noted the risks associated with ubiquitous technology access such as unwanted distractions, time-wasting activities, and reducing the quality of personal relationships. Asked whether less Internet would improve their life in any way, one participant said, "*I'd probably have more time to do more things with my son because if I'm not on it, he's on it doing his homework or something, you know? It's almost like we don't have much family time anymore*" (P-24). This is important to note because it affirms that there is nothing unique about the wants, needs, and worries of the under/unconnected from those who have connectivity. They have the same rights and the same needs they simply do not have the same access.

Universal Needs and Specific Obstacles

Overall, what we learned from the lived experiences of residents of the North End is that though the needs are general, the obstacles are specific. Affordability is the predominant barrier; the cost remains too high for the service provided. More specifically, the lack of payment options and choices for users with poor credit, reducing the options for participants, was highlighted. "*Like Wi-Fi and water. All the bills on one bill*" (P-17) and "*not even cheap, just affordable. You know, if you could do a payment plan if it cost a little bit too much*" (P-U1). Residents sometimes opt for inferior and more costly pay-as-you-go options just to get some limited connectivity. This in no way meets the expectation of universal and meaningful connectivity needed by users today, but it does satisfy their need for flexibility and provide them with some decision-making power in their lives.

During the administration of this research project, the team noted that some participants regularly went "off the grid," where phone calls, text messages, or emails would go unanswered for a while, and then regular communication would resume and then stop again, seemingly randomly. Participants shed light on this phenomenon by explaining that this correlated to pay-as-you-go packages, and users would simply run out of minutes or texts, so communications would cease until the next time they could afford to top up their service. Though it technically means that these users are "served", it is a far cry from the intent that they enjoy the benefits of connectivity in the same way that those with unbridled connectivity, technical skills, and appropriate devices to utilize it do.

Parental and Caregiver Challenges

We heard that not having connectivity can significantly impact caregivers. Often, we think of an individual adult and their connectivity, but a theme that emerged from parents and caregivers was the feeling of responsibility they displayed regarding those in their care. One parent shared that they felt a sense of failure because they were not able to provide their kids with connectivity:

> *"I'm kind of sad about it. Like I can't give my kids what they like. They want to go on the laptop, they want to go on the computer, and I don't have it and I can't afford it. So, then I feel bad. Because they need access for school. . .. So, then I don't, I don't know. I feel like I failed as a parent"* (P-30)

One parent (P-16) noted that connectivity would facilitate more contact with their child who was at the time in the care of Child and Family Services (CFS). Not only would that connection assist in relationship maintenance between parent and child, but it is also viewed by government workers as a positive indicator of parental concern and effort. One interviewee noted that during the COVID-19 lockdown, in-person parental visits were moved online to a video conferencing platform. Parents who did not attend the scheduled virtual visits were penalized for not showing up even in cases where their absence was due to technological barriers. This is not an isolated problem when "[Manitoba] has the highest per capita rate of children in care in Canada and apprehends about one newborn a day. Almost 90 percent of children in care in 2018 were Indigenous."[8] This is another example of how pre-existing discrimination, and systemic biases are amplified through the lack of access to technology and services that have moved online.

In households with children and/or elderly adults needing care, we heard participants advocating for the needs of those they cared for more than themselves. For school-aged children, an increase in Internet-related homework tasks such as researching a topic, watching a specific video on platforms like YouTube, using Learning Management Systems to get assignments and upload homework, or communicating with parents, pushed the responsibility to participate onto the parents and students. There is also the social exclusion of youth who do not have a device, whereas the majority of their classmates/friends do. Social media is where a great deal of teenage socialization happens. Not having access to these channels of communication removes the opportunity for youth to participate fully in their community.

Finally, lack of access creates opportunity costs, where caregivers could utilize technology and connectivity to better and more efficiently keep in contact with elderly parents to monitor their condition or children to provide overwatch. In this case, digital exclusion fosters reactive rather than proactive strategies. Social isolation and medical conditions that require ongoing maintenance, such as diabetes, could benefit from technology, but in many of these cases are considered luxuries. There is a lack of research into the costs of digital exclusion where a case might be made that the costs of a government providing free access could be less than the costs

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[8] https://www.cbc.ca/news/canada/manitoba/child-protection-court-manitoba-1.5181205

paid to compensate for the lack of access. Formulas to quantify the costs of not having access should be developed to be able to compare and justify new approaches to supporting broadband and digital skills initiatives.

Economic Disparities and Internet Infrastructure Quality

The analysis of CIRA Internet performance data in Winnipeg's R2W area reveals a connection between the economic status of a geographical area and Internet infrastructure quality. Affluent areas in Winnipeg enjoy diverse, competitive options, including fiber optics, while low-income areas, like the North End, face limited and costly choices. Residents in these areas struggle with high connectivity costs, hindering access to essential resources and services, particularly during the Covid-19 pandemic. This study underscores the universal need for Internet access, emphasizing economic disparities as specific barriers to meaningful connectivity. A complete review of the quantitative analysis is available at Appendix A.

The Internet performance data demonstrated a relationship between the economic status of the R2W area and the technical performance of the infrastructure in that area. This is consistent with the evidence that for-profit companies do not invest in areas of no/low return on investment (ROI), where infrastructure is typically not upgraded and older technologies continue to be utilized well beyond their useful life (ICF Canada, 2017). Our data analysis supports that this is observable in urban locations, such as in Winnipeg, as well. Many affluent areas of Winnipeg not only have existing copper telephone (POTS/ADSL[9]), and coaxial cable lines (DOCSIS[10]), these homes have recently had fiber optic cables installed directly to the home (FTTH[11]). This allows homeowners options at different price points and the ability to leave one provider for another (e.g. incumbent telco or cable company). Though limited, this does provide the "competition" that free-market regulation is based on. However, in low-income areas such as the North End, this competition is not available, and homeowners do not have many/any choices. In our interviews, residents noted that they often pay the same, or more, for an inferior service as do residents of other areas. Lack of options create a "take it or leave it" scenario where residents take the least-worst option available. As older technologies, such as copper lines and 2G/3G cellular towers, are phased out of service, telecoms and ISPs are slow to invest in replacement systems in locations where ROI is limited.

Discussion

The findings clearly underscore the correlation between economic status and the quality of Internet infrastructure, particularly in economically disadvantaged areas where residents face significant barriers to meaningful connectivity. High connectivity costs and restricted access to

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[9] Plain Old Telephone System (POTS) and Asymmetric Digital Subscriber Line (ADSL)

[10] Data Over Cable Service Interface Specification (DOCSIS)

[11] Fibre to the Home (FTTH)

essential resources have been amplified by the COVID-19 pandemic, which exposed the digital divide that exists in many communities. Despite the universal need for Internet access, economic disparities act as specific barriers, entrenching a cycle of inequality.

This digital divide hinders access to critical services such as education, employment, and basic information, especially during times of crisis. Addressing these barriers is not merely a question of technological access; it is a necessary step toward creating a more inclusive and equitable society. The literature consistently reinforces that the Internet is an indispensable utility in the 21st century essential for participation in modern life. Hudson (2022) emphasizes the need to understand the connection between community networks and socio-economic benefits. Our study adds to this body of research, highlighting that while technology alone cannot guarantee inclusion or economic prosperity, the absence of such access dramatically reduces opportunities, further entrenching inequality.

The COVID-19 pandemic has further illuminated the inequalities in digital access, making the need for targeted interventions and policy changes more urgent than ever. For example, creating subsidies for Internet service, investments in digital infrastructure for marginalized communities, and digital literacy programs could help bridge the gap. Without such targeted actions, these communities risk being left further behind in an increasingly digital world. Addressing these disparities is essential for building a more equitable future where all citizens can fully participate in the digital age, regardless of their economic background.

Conclusion and Recommendations

While Internet access is essential for equitable opportunities in employment, education, healthcare, and essential services, simply connecting individuals to the network does not guarantee economic mobility. The literature cautions against the assumption that technology alone can resolve the complexities of poverty, warning of the risks of techno-optimism. Addressing the digital divide requires more than infrastructure; it necessitates critically examining how the Internet is regulated, provided, and accessed. Advocacy and public campaigns are vital in creating a dialogue about the governance of the Internet and protecting the rights of end users, particularly in the face of the power imbalance between infrastructure owners and the individuals relying on these services.

If we are to treat the Internet as a common good, its infrastructure and the services it hosts must be managed fairly and ethically. As current systems largely prioritize short-term profits over equitable access, it is clear that unregulated commercialization is unsustainable and harmful. Change is not only necessary but urgent, and members of both the open-source technical community and non-technical advocacy organizations must collaborate to champion alternative, equitable models of Internet use. These groups strive to reclaim local control over digital resources, ensuring that people can effectively use technology to meet their own needs. As Tinglin et al. (2020, p. XI) state, "Development depends on people's ability to gain control of

and use effectively the real resources of their localities – land, water, labour, technology, and human ingenuity and motivation – to meet their own needs... A system designed to maximize short-term profits free from the expression of moral sensibility drives inevitably toward ever-increasing inequity, environmental destruction, and political corruption."

The pursuit of universal connectivity that prioritizes quantity over quality, or exclusive meaningful connectivity for the few, will not bring about significant, society-wide benefits (Internet Society, 2022, p. 23). Instead, as Loney (2016, p. 21) suggests, we must create the conditions for local economies and community initiatives to flourish. The issue goes beyond economics—it is about agency and control. Community networks, though typically small and underfunded, have demonstrated the potential to break down many of the barriers identified in the literature by prioritizing people over profit. This research emphasizes the need for sustainable models of Internet connectivity that empower communities and ensure digital inclusion for all, regardless of income or background. The "North End Connect" project in Winnipeg exemplifies a community-based participatory action research initiative designed to enable residents, particularly Indigenous and newcomer families, to take ownership of their digital needs. Working in collaboration with local organizations, this project seeks to establish a sustainable model for Internet connectivity that meets the community's needs and empowers them through collective action.

This research not only supports the advocacy efforts of organizations such as the Internet Society, Connect Humanity, and others but also illustrates that even without substantial government support, communities can take action. Through determination and collective will, these communities can challenge the dominance of large corporations and create new models of connectivity that prioritize local needs. In doing so, they bring the voices of the disconnected into the global network, improving the Internet experience for all. This socio-technical experiment may not only provide technical solutions but also transform participants' lives, fostering new relationships and opportunities previously out of reach. In sum, this research demonstrates that when communities are empowered to shape their own digital futures, they can drive meaningful change in both their local environments and the broader digital landscape.

This study adds to the growing body of research on community-based solutions to the digital divide, demonstrating the potential for local, cooperative-driven approaches to Internet connectivity. By engaging directly with residents, this research has shown that a community network, designed to prioritize the needs of the people over profit, offers a sustainable and empowering model for digital inclusion. However, while this research has shown promising outcomes, it is limited to a single neighbourhood and focuses on short-term interventions. The scalability of these solutions to other marginalized communities remains to be explored. Additionally, long-term evaluation of the community network model will be necessary to determine its sustained impact on residents' lives.

Next Steps

This research phase served to collect information from those most directly impacted by lack of access to the Internet. This yielded important evidence about the barriers that will need to be addressed in the design of any future Community Network efforts. As importantly, conducting the research in the manner it was done acted as the catalyst to spread awareness, increase visibility and advocacy, and create new relationships where trust was built across service organizations and with community members. The team will now need to secure funding and implement programming that address the barriers to see if these interventions produce positive results and can be made sustainable.

The North End Connect project (both this research phase and ongoing programming) serve to not just bring practical interventions to bear, but critically serve as a statement to support the common good and as a criticism as to how Telecommunications is currently regulated. These projects aim to create a more inclusive digital future where all citizens, regardless of their economic or ethnic background, can fully participate in the digital age. By addressing both the technological and socio-economic dimensions of the digital divide, communities can work toward equitable access to the resources and opportunities that define life in the 21st century on their own terms. It is our hope that in the future, projects like this will not be necessary as all people will experience fair and equitable access.

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References

A4AI. (2022). *Meaningful connectivity for rural communities*: Geographic barriers & policy strategies for digital inclusion. Alliance for Affordable Internet.

Abdelaal, N., & Andrey, S. (2022, January). *Overcoming digital divides series: What we heard and recommendations*. https://www.ryersonleadlab.com/overcoming-digital-divides-what-we-heard

Afzal, A., Firdousi, S. F., Waqar, A., & Awais, M. (2022). The influence of internet penetration on poverty and income inequality. *SAGE Open*, *12*(3), 1–13. https://doi.org/10.1177/21582440221116104

Andrey, S., Masoodi, M.J., Malli, N., & Dorkenoo, S. (2021, January). *Mapping Toronto's digital divide*. Ryerson Leadership Lab and Brookfield Institute for Innovation + Entrepreneurship. https://www.ryersonleadlab.com/digital-divide

Barendregt, W., Becker, C., Cheon, E., Clement, A., Reynolds-Cuéllar, P., Schuler, D., & Suchman, L. (2021). Defund big tech, refund community. *Tech Otherwise*. https://doi.org/10.21428/93b2c832.e0100a3f

Baskerville, R., & Wood-Harper, A. (1996). A critical perspective on action research as a method for information systems research. *Journal of Information Technolology*, *11*, 235–246. https://doi.org/10.1080/026839696345289

Beckinsale, M., Ram, M., & Theodorakopoulos, N. (2011). ICT adoption and ebusiness development: Understanding ICT adoption amongst ethnic minority businesses. *International Small Business Journal*, *29*(3), 193–219. https://doi.org/10.1177/0266242610369745

BDO Canada LLP. (2017). (rep.). *Broadband: The next essential utility*.

Buchnea, A. & McKitterick, M. (2020). *Responding to youth homelessness during COVID-19 and beyond: Perspectives from the youth-serving sector in Canada*. Canadian Observatory on Homelessness Press and A Way Home Canada. https://www.homelesshub.ca/sites/default/files/attachments/YS%232-CV-19%5BSummary%5D%5BV2%5D_0.pdf

Castleden, H., Morgan, V. S., & Lamb, C. (2012). "I spent the first year drinking tea": Exploring Canadian university researchers' perspectives on community-based participatory research involving Indigenous peoples. *Canadian Geographies / Géographies Canadiennes*, *56*(2), 160–179. https://doi.org/10.1111/j.1541-0064.2012.00432.x

Clement, A. H., & Gurstein, M. (Eds.). (2012). *Connecting Canadians: Investigations in community informatics*. Athabasca University Press. https://www.aupress.ca/app/uploads/120193_99Z_Clement_et_al_2012-Connecting_Canadians.pdf

Connect Humanity. (2022). *Funding to bridge the digital divide: U.S. philanthropic giving to digital equity causes*. https://connecthumanity.fund/wp-content/uploads/2022/09/ConnectHumanity_PhilanthropyFundingReport_Final.pdf

Flicker, S. (2008). Who benefits from community-based participatory research? A case study of the positive youth project. *Health Education & Behavior*, *35*(1), 70–86. https://doi.org/10.1177/1090198105285927

Francella, D. (2022). *The economic consequences and generational impact of the digital divide.* Belfer Center for Science and International Affairs, Harvard Kennedy School. https://www.belfercenter.org/sites/default/files/pantheon_files/files/publication/TAPP-Francella_Impact%20of%20the%20Digital%20Divide_Final_220516.pdf

Friedline, T., & Chen, Z. (2021). Digital redlining and the fintech marketplace: Evidence from U.S. zip codes. *Journal of Consumer Affairs, 55*(2), 366–388. https://doi.org/10.1111/joca.12297

Government of British Columbia. (2022). *Final report: Connecting British Columbia* (January 12). https://www2.gov.bc.ca/assets/gov/british-columbians-our-governments/services-policies-for-government/initiatives-plans-strategies/Internet-in-bc/pdfs/ndit_final_report_jan_1222.pdf

Greene, D. (2021). *The promise of access: Technology, inequality, and the political economy of hope*. Cambridge, MA: MIT Press.

Gurstein, M. (2007). *What is community informatics (and why does it matter)*? Polimetrica. https://archive.org/details/Gurstein

Haight, M., Quan-Haase, A., & Corbett, B. A. (2014). Revisiting the digital divide in Canada: The impact of demographic factors on access to the Internet, level of online activity, and social networking site usage. *Information, Communication & Society, 17*(4), 503–519. https://doi.org/10.1080/1369118X.2014.891633

Hambly, H., & Rajabiun, R. (2021). Rural broadband: Gaps, maps and challenges. *Telematics and Informatics,* 60, 101565. https://doi.org/10.1016/j.tele.2021.101565

Hudson, H. (2022). Research on community networks: What's old is new again. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4212025

ICF Canada. (2017). *Broadband: The essential utility*. Toronto: *ICF Canada* Retrieved from https://icf-canada.com/public-reports-white-papers/

Innovation, Science and Economic Development Canada. Government of Canada (2019, November 22). *Connecting families initiative*. Retrieved from https://www.ic.gc.ca/eic/site/111.nsf/eng/home

Internet Society. (2022). *Financing mechanisms for locally owned internet infrastructure*. https://www.Internetsociety.org/resources/doc/2022/financing-mechanisms-for-locally-owned-Internet-infrastructure/

Lingel, J. (2021). *The gentrification of the Internet: How to reclaim our digital freedom*. University of California Press.

Loney, S., & Braun, W. (2016). *An army of problem solvers: Reconciliation and the solutions economy*. Friesens.

MacKinnon, S. (2018). *Practising community-based participatory research: Stories of engagement, empowerment, and mobilization*. UBC Press. http://ebookcentral.proquest.com/lib/ucalgary-ebooks/detail.action?docID=5321183

Mangla, T., Paul, U., Gupta, A., Marwell, N. P., & Feamster, N. (2022). Internet inequity in Chicago: Adoption, affordability, and availability. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4182994

McMahon, R. (2014). From digital divides to the first mile: Indigenous peoples and the network society in Canada. *International Journal of Communication*, *8*, 25. https://ijoc.org/index.php/ijoc/article/view/2456/1187

McMahon, R., McNally, M., & Joseph, K. (2020). Shaping "digital futures" in Alberta: Community engagement for rural broadband development. *Canadian Journal of Communication, 45*(1), 25–51. https://doi.org/10.22230/cjc.2020v45n1a3527

Mersereau, M. (2021). The essential internet: Results from a study into household Internet use at the Toronto Community Housing Corporation. *First Monday, 26.* https://doi.org/10.5210/FM.V26I3.11066.

Mora-Rivera, J., & García-Mora, F. (2021). Internet access and poverty reduction: Evidence from rural and urban Mexico. *Telecommunications Policy*, *45*(2), 102076. https://doi.org/10.1016/j.telpol.2020.102076

Mundie, J. (2022). Many Canadians struggle to afford pricey high-speed home Internet in urban areas | *National Post* (n.d.). https://web.archive.org/web/20221230190754/https://nationalpost-com.cdn.ampproject.org/c/s/nationalpost.com/feature/left-behind-urban-Internet-access/wcm/ecf3646c-7729-4c35-a0e1-cf34d7e565c2/amp/

Nowak, P. (2023). Carnage in Canadian telecom: More competitors eliminated. https://blogs.teksavvy.com/carnage-in-canadian-telecom-more-competitors-eliminated

Reglitz, M. (2020). The human right to free internet access. *Journal of Applied Philosophy*, *37*(2), 314–331. https://doi.org/10.1111/japp.12395

Silver, J. (2010). Winnipeg's North End - Yesterday and today. *Canadian Dimension*. Retrieved from https://canadiandimension.com/articles/view/winnipegs-north-end

Szoszkiewicz, Ł. (2018). Internet access as a new human right? State of the art on the threshold of 2020. Przegląd Prawniczy Uniwersytetu im. Adama Mickiewicza, (8), 49–62. http://dx.doi.org/10.14746/ppuam.2018.8.03

Tarnoff, B. (2022). *Internet for the people: The fight for our digital future* (1st ed.). Verso.

Templeman, J., (2022). Chapter 6: The razor's edge: How to balance risk in artificial intelligence, machine learning, and big data. *Open Education Alberta*. https://doi.org/10.11575/etn1-4302

Tinglin, W., & Joyette, D. (2020). *Community engagement in a changing social landscape*. FriesenPress.

Tongia, R., & Wilson, E. J. (2011). The dark side of metcalfe's law: Multiple and growing costs of network exclusion. *International Journal of Communication, 5,* 665–681. https://cstep.in/drupal/sites/default/files/2019-07/CSTEP_JP_dark_side_metcalfe.pdf

United Nations General Assembly (2016). *Human Rights Council thirty-second session, agenda item 3: promotion and protection of all human rights, civil, political, economic, social and cultural rights, including the right to development*. https://www.article19.org/data/files/Internet_Statement_Adopted.pdf

Weeden, S. A., & Kelly, W. (2020). Addressing the digital divide: COVID-19 and the importance of connecting rsural Canada. https://crrf.ca/ri-digital-divide/

Wylie, B. K., Winseck, D., Klass, B. (2021). The proposed Rogers-Shaw merger exposes a deeply flawed internet access model. *Centre for International Governance Innovation*. https://www.cigionline.org/articles/proposed-rogers-shaw-merger-exposes-deeply-flawed-Internet-access-model/

Zuboff, S. (2015). Big other: Surveillance capitalism and the prospects of an information civilization. *Journal of Information Technology*, *30*(1), 75–89. https://doi.org/10.1057/jit.2015.5

Appendix A

One of the big problems with universal connectivity is the way in which the regulators and the government measure and fund connectivity in Canada. There is no clear way for the consumer to know the quality of the service they pay for or hold their provider accountable for the service promised. The determination of who is considered connected is controversial, and it is hard to quantify technical indicators that users do not commonly understand. Physical availability within a geographical area and self-reported service levels submitted by Internet providers with little to no input from the users speaking to their experience do not give the consumer enough information to make informed choices. One such rebuttal to the monologue that everyone has adequate access to is crowd-sourced, real-time performance tests that calculate and record actual function tests. The Canadian Internet Registration Authority (CIRA) runs the Internet Performance Test (IPT) as an impartial third-party source of this data. The IPT is built on the M-Lab platform (https://www.measurementlab.net/about/). Our project team was given access to this data for the purpose of our research through a custom portal at https://performance.cira.ca/northendconnect.

The Canadian Radio-television and Telecommunications Commission (CRTC) defines the minimum standard of "high-quality Internet" as meeting the following criteria: download speed greater than or equal to 50 megabits per second (Mbps), upload speed greater than or equal to 10 Mbps, jitter smaller or equal to 5 milliseconds (ms), latency smaller or equal to 50 ms, and packet loss smaller or equal to 0.25%. CIRA data was used to examine Internet performance for users in Winnipeg, Manitoba. In a sample of 12,260, only 11.3% of all Internet performance tests taken between October 31, 2019 and June 13, 2023, met the criteria for high-quality Internet. Thus, a significant majority of Internet performance tests (88.7%) failed to meet the minimum standard of Internet performance set by the CRTC. Despite this, Winnipeg is considered 100% connected by the Government of Canada.

Forward sortation areas (FSA) (the first three characters of a Canadian postal code) were used to analyze differences between areas of the city on measures of Internet performance. Looking at the 11.3% of tests that satisfied the benchmark of high-quality Internet, Winnipeg's North End (defined as R2W) and Point Douglas (R2X) each accounted for only 3.4% of the results compared to St. Vital North (R2M) at 17.2%, Fort Garry NE (R3T) at 11.9%, St. Vital SW (R2N) at 7.2%, Inkster West (R2R) at 6.4%, the Exchange District (R3B) at 5.8%., St. James NW (R2Y) at 4%, and Downtown/The Forks (R3C) at 3.8%. It is noteworthy that most tests that met the standard for high-quality Internet fell in upper-middle-class areas of Winnipeg. Out of the 31 postal prefixes that were analyzed, only 7 (23%) had median metrics that met the criteria for "good Internet", as defined by the CRTC: River East South (R2L), Inkster West (R2R), Point Douglas (R2X), St. James SW (R3K), Fort Garry NE (R3T) and Fort Garry West (R3Y). The median metrics for the North End (R2W) were Upload Speed = 6.59 Mbps, Download Speed = 50.97 Mbps, Jitter = 1.13 ms, Latency = 52.32 ms, and Packet Loss = 3.64%. Upon sorting areas of Winnipeg from 'best' to 'worst,' where best was defined as having high median upload and download speeds, and low median jitter, latency and packet loss, the North End was ranked 26th out of 31.

An Analysis of Variance (ANOVA) was run to determine if there were statistically significant differences in each of the 5 key metrics between postal prefix and the test determined that there was: Upload Speed [$F_{(4,12229)}$ = 23.360, p = 2.483e-124, Download Speed [$F_{(4,12229)}$ = 31.231, p = 9.632e-171, Jitter [$F_{(4,12229)}$ = 3.076, p = 3.204e-08, Latency [$F_{(4,12229)}$ = 28.073, p = 3.644e-152, and Packet Loss [$F_{(4,12229)}$ = 54.729, p = 3.715e-306. These results indicate that the geographic area is a significant factor in explaining the variations observed in these metrics within the Winnipeg dataset. Specifically, there are meaningful differences between the North End (R2W) and the other postal prefixes for each of the 5 metrics where α < 0.05: Upload Speed $t_{(12258)}$ = 2.037, p = 0.042, Download Speed $t_{(12258)}$ = 6.352, p = 3.399e-10, Jitter $t_{(12258)}$ = -2.646, p = 0.008, Latency $t_{(12258)}$ = 7.624, p = 5.343e-14, and Packet Loss Speed $t_{(12258)}$ = 15.819, p = 6.767e-50.

A more conservative alpha level (α = 0.01) was used to determine which postal prefixes were significantly larger or smaller relative to the North End (R2W) on each of the key metrics used to analyze Internet performance. The FSAs that were not meaningfully different were excluded from the graphs.

Significant Differences in Median Download Speed Relative to R2W

Significant Difference in Median Jitter Relative to R2W
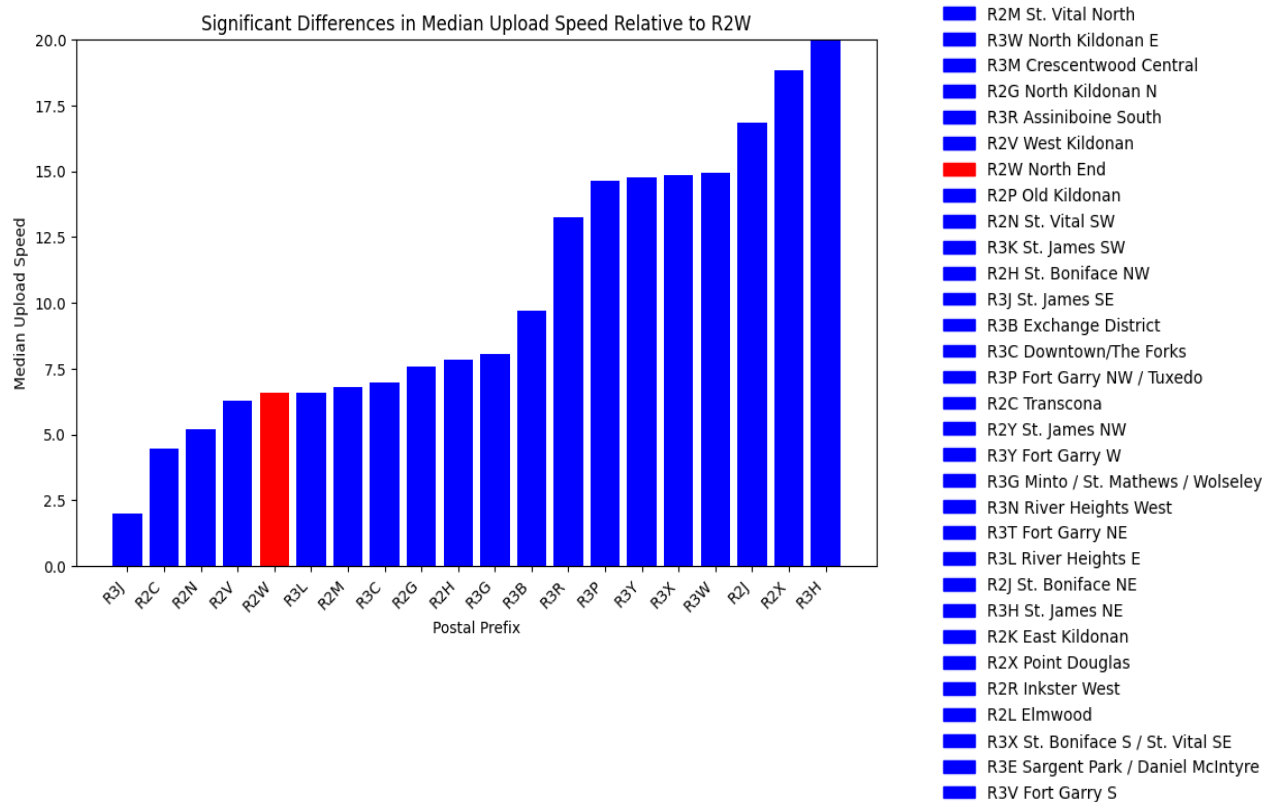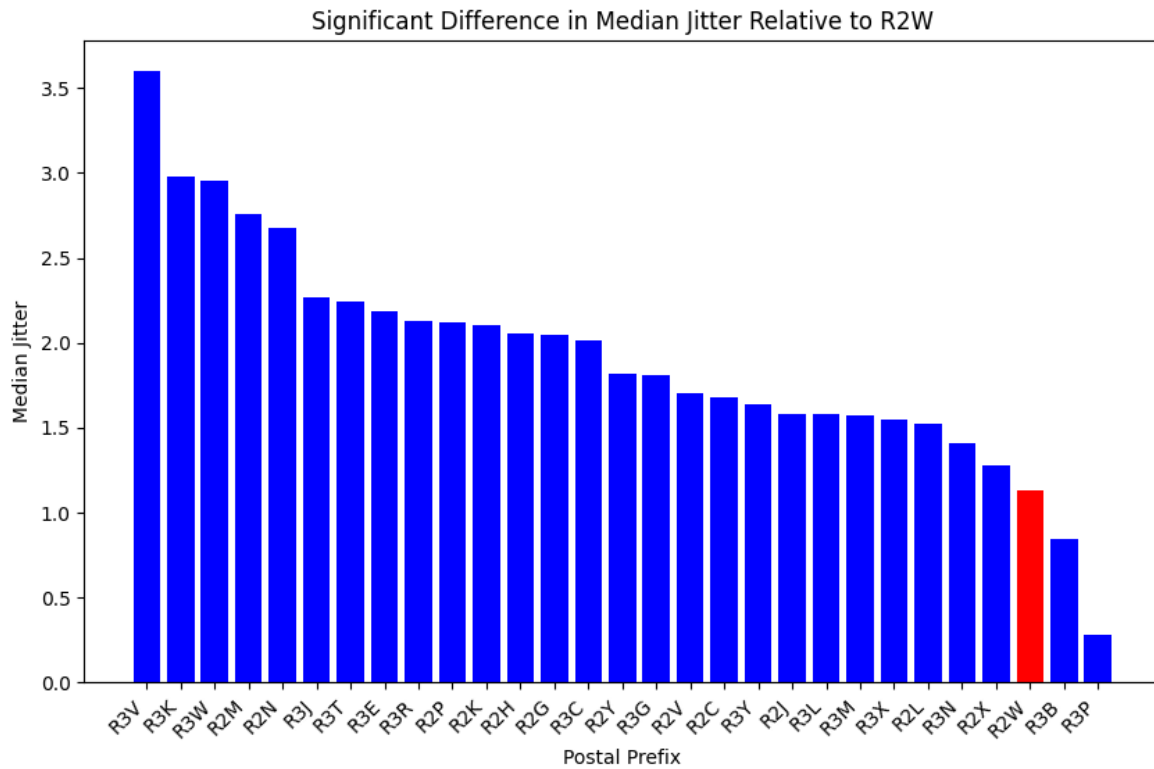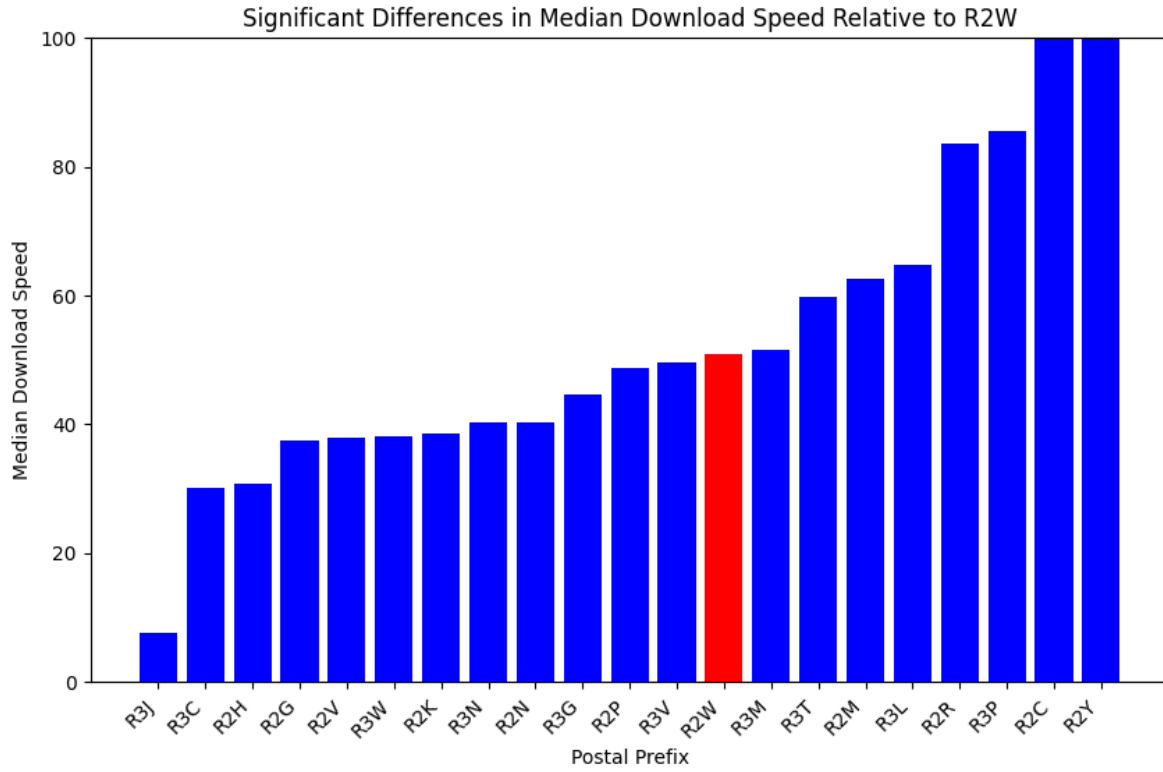
The purpose of this quantitative analysis was to validate the anecdotal experiences of North End residents who described their user experience as poor, and many of whom felt that they were not getting what they paid for. It is reasonable to believe that without significant investment in upgrades to the incumbent's infrastructure in these areas, the problem will continue to get worse as equipment continues to age and load/demand on the system continues to grow.

Limitations and Recommendations for Further Research

This quantitative review of the IPT data was very limited in scope and needs to be repeated over time to demonstrate trends better. Additional work in visualizing the data in the form of heat maps would be beneficial, but it fell outside of the scope of this project. There are limitations and criticisms about recording the performance of the Internet when there are so many factors that impact the results, and the parameters are extremely difficult to control to ensure consistent testing practices. There are efforts underway by other research teams that will hopefully improve this situation, but for now, the information we have is enough to suggest that things are not as wonderful as the commercials would leave us to believe. A community network in the North End of Winnipeg may not be achievable in the short term or sustainable in the long term, but building on successes in other jurisdictions suggests that going through the process of engagement and experimentation is in itself a positive exercise if for no other reason than it returns a sense of agency to an otherwise marginalized community. Taking a strengths-based view of the situation allows for direct community involvement, leveraging organizations and experts who can facilitate the project. These next phases of the project should be researched to identify the areas that did not execute as expected.

The source data and the code used to clean and process the data can be found for review and future re-use in the open-source software repository GitHub at: https://github.com/InternetSocietyManitobaChapter/JupyterNotebook_NorthEndConnect