# "It's like another world": Intra-Rural Digital Divides and Public Libraries as Rural Assets

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While rural-urban approaches to digital divide research are common, less attention is paid to intra-rural digital divides occurring within rural areas. Hidden intra-rural digital divides can persist as rural-urban divides close, furthering digital inequity. Through six months of multi-sited ethnography in a rural Appalachian county, I highlight the presence and impacts of intra-rural digital divides. Analyzing these findings alongside existing literature on intra-rural digital divides, I contribute a framework of dimensions by which intra-rural digital divides can be defined. Drawing upon assets-based approaches in rural HCI and CSCW research, I identify rural public libraries as an important asset to be leveraged in closing intra-rural digital divides and advocating for intra-rural digital equity and inclusion.

CCS Concepts: • **Human-centered computing** → **HCI theory, concepts and models**; **Field studies**; **Collaborative and social computing theory, concepts and paradigms**; • **Social and professional topics** → *Cultural characteristics.*

Additional Key Words and Phrases: rural, digital divide, Appalachia, public libraries

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## 1 Introduction

The rural-urban digital divide between residents of rural and urban locales in the United States is well-established [11, 86]. Limited access to computing infrastructure, or skills to effectively use it, can prevent rural residents from accessing benefits that technology affords, from education and financial opportunity to social and entertainment benefits. A binary approach to digital divide research has the potential to mask more nuanced digital divides present within rural or urban areas. In rural areas, such *intra-rural digital divides* have received limited attention in research thus far. Of the work that has explored intra-rural digital divides, much research has focused on use of technology in the specific context of work and industry [8, 9, 42, 43, 89, 90], for example, looking at rural farmers' use of agricultural technology. Here, I explore impacts of intra-rural digital divides across diverse contexts of digital use, such as education, leisure and social connection, in addition to work. Prior intra-rural digital divide research that has looked at broader contexts of digital access and use have primarily focused on the identification of these divides, but have not explored impacts of these divides on residents' experiences with technology [19, 30]. In this work, I utilize ethnographic methods to gain in-depth perspectives of residents' experiences of intra-rural digital divides.

Prior work on intra-rural divides across other domains such as income [39, 82], health [36–38, 45], and mortality [29, 55, 56] have demonstrated how failure to acknowledge and understand these divides risks perpetuating them, with continued and increased harms to those already at the

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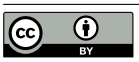


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margins of power structures. In this work, I aim to counteract this risk by bringing attention to the presence and impacts of intra-rural digital divides in one rural Appalachian county.

This work centers around the following research questions:

- **RQ1:** What disparities are present in computer and internet access, use, skills, and perception between different communities within the same rural county?
- **RQ2:** How can local assets be leveraged to resolve intra-rural digital divides in rural Appalachia?

In this paper, I utilize a descriptive definition of rurality, in line with Hardy et al.'s definitional framework [34]. In my comparative analysis of towns in one rural county[1], I describe towns with larger populations, greater population density, and closer proximity to population centers (e.g., downtown areas with clustered businesses and housing) as being less rural. Conversely, towns I describe as more rural are more remote, with smaller populations and lower population density. Similarly, I characterize the entire county as rural in alignment with its US Census designation, which is based on similar definitional factors.

In alignment with prior rural HCI work [31, 49], I reject the rural deficit model here in favor of community-driven, assets-based approaches to resolving digital divides impacting rural communities. This paper builds on prior work in assets-based design as I investigate public libraries as assets in the context of intra-rural digital divides. Libraries' foundational values of community trust and equal access make them instrumental for access to information, including internet access and e-government services [17, 41]. Public libraries also serve an important social role as community centers and hubs for social cohesion, with librarians being seen as respected key figures within their communities [28, 44], particularly in rural areas [27, 53, 54, 77, 81]. Working with rural public libraries from an assets-based perspective, I found that they utilized their community role and resources to reduce impacts of intra-rural digital divides. The librarians I worked with held dual-roles as community-advocates and members of a greater community of librarians. In their community-advocate role, they had a close view of the challenges and assets of their local community and used this to effectively advocate for their community's needs. In their role in the community of librarians, they could access collective resources and gain perspective on the conditions in other communities in the area. Through these two perspectives, librarians worked together to create greater digital equity with benefits to residents throughout the county.

In this work, I make two primary contributions. First, addressing **RQ1**, I contribute an in-depth analysis of the presence of intra-rural digital divides in this county, the ways these divides manifest, and the impacts they cause across diverse contexts of digital use. Analyzing these results, alongside the prior literature, I contribute a framework for characterizing intra-rural digital divides that can help to ground future rural HCI and CSCW research. Secondly, addressing **RQ2**, I contribute an assets-based approach to addressing intra-rural digital divides by leveraging rural public libraries and librarians as drivers of equity in their local, and broader, communities.

## 2 Background

### 2.1 The Digital Divide and Intra-Rural Digital Divides

Prior digital divide research has established three levels by which digital divides can occur. The first-level digital divide refers to a lack of access to internet and information and communication technologies (ICTs) for those impacted by the digital divide [18, 35, 85, 91]. While some assume that digital access is a solved issue in the Global North, the presence of the digital access divide in rural Appalachia has persisted while rural/urban digital access divides have closed elsewhere

[1]In the United States, counties are geographic subdivisions within states used for political and administrative governance.

in the rural United States [62]. The second-level digital divide concerns differences in knowledge, skills, usage, and experience with ICTs [18, 35, 83, 85, 91]. This issue can persist beyond resolution of first-level digital divides to perpetuate inequity between those skilled with the use of ICTs and those who are not [18, 35, 85, 91]. Recent conceptualizations of the digital divide have also surfaced a third-level digital divide wherein those with similar digital access and skills may still experience digital inequity through differentiated outcomes of use. [74, 84].

Intra-rural digital divides have been investigated across a variety of these dimensions and geographical and cultural contexts [8, 9, 19, 30, 42, 89, 90]. Evaluating four rural towns in the United States, Donnermeyer and Hollifield identified intra-rural digital divides in the dimension of digital outcomes, between residents with different ages and sociodemographic profiles, and communities with different rates of population and economic growth [19]. In an agricultural context, researchers have identified digital divides between rural farmers, both personally and professionally, along dimensions of adoption, use, and skills [8, 9, 89, 90]. These intra-rural digital divides aligned with socioeconomic and demographic factors such as occupation, education, age, farm size, and farm sector [8, 9, 89, 90]. Hambly and Rajabiun examined intra-rural access divides in Canada across different geographic areas, highlighting the dynamic nature of the intra-rural access divide as areas fluctuate in population and existing service offerings no longer meet local needs [30]. In the rural Western United States, Kahn and Burrell identified a number of sociocultural factors to explain differentiated engagement with different sectors of Internet-enabled work [42]. They identified intra-rural digital divides between individuals based on gender, urban transplant or rural-origin status, and white-collar or blue-collar occupation.

With such a range of factors identified as playing a role in the presence and impact of intra-rural digital divides, it remains an open question how such divides may be addressed and if existing mechanisms for digital inclusion can be leveraged for this purpose.

### 2.2 Rural Public Libraries and Library Technology

As key centers for digital inclusion, public libraries have been established as sources of opportunity for economic, educational, and social development to community members that they serve [24, 53, 77, 80, 81]. Public libraries are often a community's only source of public-access internet and computing technology [40, 53, 64, 81], and typically offer some level of technical help or instruction, either formally or informally [40, 64]. Public library technology has been shown to be effective in influencing technology adoption within served communities [64, 79, 92] and is disproportionately advantageous to low-income library patrons [26, 57, 81], making it an effective tool to address first- and second-level digital divides. In addition to these instrumental roles in supporting technology access and use, libraries also serve an important social role in their communities [28, 44]. Even in extreme circumstances of socio-political conflict in warzones, libraries serve as a critical asset for education, safety, and community [23, 88]. Librarians are trusted community members to whom patrons turn for resources and information when facing crisis [27, 81, 87]. This community role that rural libraries serve has been specifically noted in an Appalachian context [53, 54].

### 2.3 Research Setting: Rural Appalachia

Appalachia is a subregion of the eastern United States spanning 423 counties in 13 states. Rural Appalachia is systemically disadvantaged in the United States, with higher rates of poverty, mortality, morbidity, and substance abuse compared with average national rates [3, 4] and lower rates of broadband access [46], education [97], and health care [4]. Appalachian residents have historically faced exploitation and abandonment from government, research, and industry [47, 68, 73]. In addition to these factors of disenfranchisement, Americans from other regions outside of Appalachia

hold harmful stereotypes of residents of Appalachia [14, 99], viewing them as substantially different, with negative connotations [66, 67, 73].

Prior work has highlighted the need for specific cultural considerations to be made when designing solutions to disenfranchisement in Appalachia [20]. Appalachian culture is often misconstrued as merely an extension of the regional economic, health, mortality, and educational trends, effectively blaming citizens of the region for sustaining the hardships they experience [6, 16, 20, 58, 60, 69, 73, 99]. This characterization has recently been repopularized in the mainstream through works like J.D. Vance's Hillbilly Elegy[2], which has been criticized by Appalachians as perpetuating harmful stereotypes [51]. Many of the stereotypes that are mislabeled as an Appalachian "culture of poverty" are, instead, a reactive response to hardships imposed on the region and its citizens that are beyond their control [6, 16, 20, 60]. Utilizing assets-based approaches in Appalachia can help to counter the deficit-driven "culture of poverty" narrative and other negative stereotyping of the region.

### 2.4 The Deficit Model in Rural HCI and Assets-Based Thinking

The deficit model or deficit perspective is well-documented as a common approach taken when researching rural areas across domains such as health, education, and computing [10, 15, 31, 78]. This deficit perspective describes rural areas as inherently problematic, with issues facing them being attributable to qualities of rurality, and positions rural residents as being incapable of helping themselves or possessing problem-solving qualities. This deficit model is also used in studies of digital divides to ascribe non-use of technology to personal failings of non-users [76]. Considering that digital divides are often considered from a rural-urban perspective, with rural residents on the "have-not" side of divides, rural residents are doubly impacted by deficit models which depict them as problems to be solved.

Recent work in HCI has rejected the deficit model in favor of assets-based approaches, considering the assets that marginalized and under-resourced communities can use to drive community-based solutions and development [31–34, 59, 93–96]. In rural HCI, assets-based approaches have helped to position rural areas as different from, rather than less than, urban areas [32]. In the context of digital inclusion, Reisdorf and Rhinesmith advocate for an approach that leverages assets of digitally excluded areas rather than imposing interventions rooted in external values and beliefs [65]. In Appalachia, rural public libraries have been highlighted as a key asset for their local communities which can be leveraged for community development [53].

## 3 Methodology

### 3.1 Positionality

Ethnographic research approaches recognize both insider and outsider perspectives as complementary pieces to the analysis of the topic of study [22]. I come to this research as an outsider to this community, to Appalachia, and to rural life more generally. I grew up in Maryland, in the suburban sprawl surrounding Washington DC. By building strong relationships within the community and conducting data collection through immersive fieldwork, I have taken measures to understand insider perspectives of each observed situation and research topic. Bringing my own outsider perspective to this methodology has helped to contextualize observations and findings. For example, bringing my own lived experience of technology use on the advantaged, "urban" end of the rural-urban digital divide helped me to recognize how my participants' understandings of their

[2]J.D. Vance is an American politician who originally gained prominence through his memoir "Hillbilly Elegy" in which he describes Appalachia as a "culture in crisis," using experiences from his upbringing to make claims about welfare, work ethic, and economic insecurity that align with the "culture of poverty" model

own experiences with technology were situated in a broader picture of technology use throughout the rural-urban spectrum in the United States. For example, though some participants described the digital landscape on the east end of the county as being far superior to that on the west end, my experience using technology in urban contexts allowed me to contextualize digital experiences I observed against an even broader digital landscape. While I do not see my outsider status in this work as a detriment, I acknowledge prior work in HCI that has discussed the risks of outsider research conducted with vulnerable or marginalized populations [48, 71] and have taken steps to mitigate risk such as involving participants in the development of research aims and activities and member-checking my findings with library staff throughout the analysis process.

### 3.2 Procedure

This research was conducted as multi-sited ethnography, gathering a deep, rich view of the research site and problem of study [22] and acknowledging that communities are rooted in the context of the larger systems that they are part of [50]. In this work, I conducted comparative fieldwork at each of six towns with a public library in one county. Each library serves additional, smaller towns in their vicinity. I chose to engage libraries as research sites for this work due to the role they play in rural communities as "third places" and equal distributors of computing resources for community members [28, 40, 64]. Rural Appalachia's population skews elderly compared with other areas of the United States; by hosting research activities in public libraries, I aimed to engage participants across age demographics to gain a more representative view of local residents that may have been more difficult if I hosted activities at institutions with age restrictions, such as schools. Further, as rural library staff have been established in the literature as key community figures [27], I leveraged them as champion participants to aid participant recruitment and gain a broader understanding of the area and its residents through their observations.

I engaged in relationship building with the community for approximately 1.5 years before beginning the six months of ethnographic research that comprised the majority of data collection for this work. Thus, the total duration of this research, from first visit to last, was approximately two years. During this relationship building, I worked with library staff to establish the research goals of this project based on community needs. I then visited sites for a one-week period four times over the course of six months (February - August 2023), conducting observations and unstructured interviews in addition to more formalized research activities, immersing myself in local culture, and taking fieldnotes which were then used as an additional data source [21, 22]. During the first of these week-long visits, I interviewed local residents to learn about their experiences and goals with technology and to collaboratively develop the research aims and activities. Research activities for this work were primarily conducted at five of the six public libraries in the county. As I will discuss in greater detail in section 4.3, the largest library in the county, located in Wheaton, elected not to participate in this research. Typically, during one week of fieldwork, I spent one day at each of the five libraries, resulting in an approximate total of four days at each of the five libraries, or 20 total days of structured data collection.

After each visit, I analyzed data and reviewed memos and fieldnotes to plan the next visit. Thus, research plans, including my interview guide, were developed iteratively, in response to emerging findings. This work was conducted through an ethnographic lens, intending to tell the story of these communities in a way that accurately represents my participants' experiences, while simultaneously acknowledging my own presence in this work [22]. I have member-checked the analysis of my results with research participants in an effort to ensure that I have appropriately captured their expressed opinions and perceptions of the local area. To protect the anonymity of my participants, they are all referred to by IDs throughout this work. I have also provided pseudonyms for the towns and other identifiable locations.

*3.2.1 Interviews.* Semi-structured interviews were conducted either individually or in groups of two or more people. Participants were recruited using sign-up sheets displayed at each participating library. Announcements about research activities were also made on local radio shows and posted in local newspapers. In total, 25 people participated in interviews [3]. The only participation criteria was that participants had to be over 18 years old. Participants' experience with technology ranged; some participants had virtually no prior experience using a smartphone or computer and others were regular technology users with years of experience, and had advanced technical skills such as computer programming. Seven participants were library staff, two were staff of a local community-based tech support service, one was IT staff at the local community college, and the remaining 15 were library patrons. Seven participants participated in group interviews. These group interviews had, two, two, and three participants. All other participants were interviewed individually. Interviews were scheduled for one hour timeslots. The shortest interview was 16 minutes and the longest was one hour and 12 minutes, with an average length of 52 minutes. Interview questions were designed to cover two key themes: (1) participants' experiences of first- and second-level digital divides through digital access, skills, and use; (2) participants' perceptions of the local area, including their own town and surrounding towns. In focusing interviews around these two themes, I aimed to understand local digital experiences, and the presence and impact of intra-rural digital divides in the area. The interview guide is available in Appendix A. Interviews were audio recorded and transcribed through a third-party transcription service. Participants were compensated $30 for participating in an individual interview and $20 for participating in a group interview. After participating in an interview, participants were asked to complete a brief questionnaire to record demographic details which are reported in Table 1. The study procedure was approved by the author's university's institutional review board.

### 3.3 Data Analysis

My approach to data analysis was informed by constructivist grounded theory [12]. In utilizing constructivist grounded theory for the analysis of my data, I integrate the constructivism present throughout my data collection approaches to the analysis process as well. Constructivist grounded theory brings social constructivism to grounded theory through its integration of researcher reflexivity in accounting for their role in interpreting the results not as an objective neutral observer, but as someone necessarily bringing their worldview into the research. I conducted data collection and analysis iteratively so that early analysis could inform later data collection. I coded interview transcriptions inductively before all the fieldwork was complete so that initial analyses and findings might inform later research activities. The analysis produced a set of initial codes such as: *business closures on western end; judgment of western end; feeling left behind by technology advancements; libraries are their own community; value of library to community.* As themes began to emerge, I grouped codes into identified themes, for example: *East vs. West; Feeling left behind; Library community.* For later data analysis, I also engaged with comparative methods of constructivist grounded theory [12] by comparing data from later fieldwork with earlier transcriptions to assess the extent to which the patterns and themes I identified early on were present in the later data and vice versa.

In addition to this coding process, I wrote memos and engaged in situational analysis [13] to further consider different aspects of these themes that I could explore throughout the remaining fieldwork. I used situational analysis as a supplementary method of data analysis in which I iteratively created situational maps of the different entities, actors, perspectives, and ideas at

[3]Five other people participated in other research activities throughout the broader ethnographic study and are included in Table 1 to reflect that their participation in this ethnography has informed my interpretation of the findings presented here

| ID | Age | Gender | Race | Education | Annual income | Participation site |
|---|---|---|---|---|---|---|
| M1 | 69 | Male | White | Master's degree | 10,000–19,999 | Meadowville |
| M2 | 71 | Female | White | High school diploma or GED | N/A | Meadowville |
| M3 | 58 | Male | Half white half native American | High school diploma or GED | 20,000–29,999 | Meadowville |
| M4 | 73 | Female | White | High school diploma or GED | 10,000–19,999 | Meadowville |
| M5 | 66 | Female | White | College diploma | 30,000–39,999 | Meadowville |
| M6 | 51 | Female | White | High school diploma or GED | Up to $10,000 | Meadowville |
| M7 | 67 | Male | White | Doctorate degree | 70,000–79,999 | Meadowville |
| B8 | 77 | Male | White | Some college | 20,000–29,999 | Bellgrove |
| B9 | 39 | Male | White | High school diploma or GED | 100,000–149,999 | Bellgrove |
| B10 | 75 | Female | White | Associate's Degree | 60,000–69,999 | Bellgrove |
| P11 | 69 | Male | White | High school diploma or GED | 40,000–49,999 | Parsons |
| P12 | 74 | Female | White | High school diploma or GED | N/A | Parsons |
| P13 | 40 | Male | White | Some high school or less | Up to $10,000 | Parsons |
| P14 | 51 | Male | White | High school diploma or GED | 10,000–19,999 | Parsons |
| P15 | 60 | Female | White | High school diploma or GED | 20,000–29,999 | Parsons |
| P16 | 63 | Male | White, Hispanic, Latino, or Spanish | College diploma | 50,000–59,999 | Parsons |
| P17 | 66 | Male | White | Master's degree | 20,000–29,999 | Parsons |
| W18 | 37 | Male | White | Associate's Degree | 70,000–79,999 | Wheaton |
| W19 | 23 | Male | White | Associate's Degree | 30,000–39,999 | Wheaton |
| W20 | 35 | Male | White | Some college | 50,000–59,999 | Wheaton |
| T21 | 72 | Female | White | Master's degree | 100,000–149,999 | Thurman |
| T22 | 75 | Female | White | Associate's Degree | 10,000–19,999 | Thurman |
| T23 | 70 | Female | White | Associate's Degree | 50,000–59,999 | Thurman |
| T24 | 74 | Female | White | Associate's Degree | N/A | Thurman |
| T25 | 77 | Female | White | Master's degree | 60,000–69,999 | Thurman |
| T26 | 73 | Female | White | Master's degree | 10,000–19,999 | Thurman |
| H27 | 74 | Male | White | Some college | 60,000–69,999 | Hillmere |
| H28 | 53 | Female | White | Master's degree | 60,000–69,999 | Hillmere |
| H29 | 60 | Male | White | Some college | More than $150,000 | Hillmere |
| H30 | 29 | Male | White | College diploma | 10,000–19,999 | Hillmere |

Table 1. Participant demographics. Each ID is prefixed with the initial of the participation site.

play in a given situation. I often used situational mapping as a sensemaking exercise to envision connections between qualitative codes and memos that emerged from interview transcriptions.

Throughout the analysis, I periodically discussed emerging themes with library staff to member-check the validity of the findings. From this inductive, iterative process of open coding, memoing, and situational mapping, key themes emerged which informed the findings presented here. In my final visit to the research sites, I discussed key themes and findings, including those presented in this paper, with library staff to member-check their accuracy. Library staff confirmed that my interpretations aligned with their experiences and observations of the local community.

### 3.4 Research Sites

There are six public libraries in Fairmont County, in each of the following towns: Bellgrove, Meadowville, Parsons, Thurman, Hillmere, and Wheaton. These six towns are the largest in the county and their residents comprise approximately 11,000 of the county's 33,000 residents, with many in the county living in smaller towns and unincorporated communities. Therefore, each library serves its immediate community, as well as residents living in smaller, neighboring communities. While I do not have participants from the library staff at Wheaton or patrons from this library, as I discuss in more detail in Section 4.3, the interactions I have had with them and what I learned about them from other participants informs the way they are represented in this work. I will now describe the characteristics of the libraries and towns in this county.

*3.4.1 Meadowville.* Meadowville is a town of less than 1,200 people on the western end of Fairmont County. It is challenging to get to Meadowville from the east, particularly in the wintertime, as the

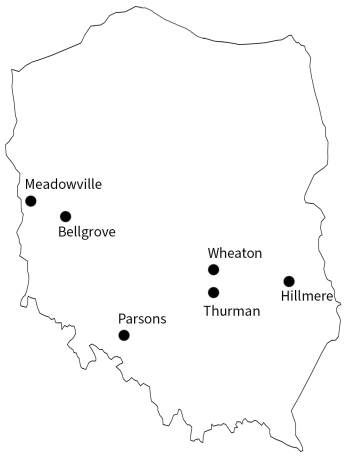


Fig. 1. Map of the six towns' location in the county[4]


Fig. 2. The Meadowville Public Library front entrance. West end, pop. <1,200.

Fig. 3. The side view of the Meadowville Public Library. West end, pop. <1,200.

route can be treacherous as it winds through the Appalachian mountains. Meadowville used to be a logging town, but the logging industry has lost prominence in the area. The library (Figures 2 and 3) consists of two primary rooms, with an atrium between them where the circulation desk is located. Behind the circulation desk is a large, private room that community members reserve for classes, meetings, and other events, and a kitchenette. In addition to Meadowville's full-time library director, they also have one part-time library staff member.

*3.4.2 Bellgrove.* Bellgrove is a town of less than 900 people on the western end of Fairmont County, just east of Meadowville. The Bellgrove Public Library (Figure 4) is a two-room building that was converted from a hardware store into the library after a flood devastated the previous library location. In addition to Bellgrove's full-time library director, they also have two part-time library staff members.

[4]The county shape has been altered.

*3.4.3 Parsons.* Parsons is the smallest library in the county. The town is located in the center of Fairmont County and has a population under 1,000. The library (Figure 5) is a one room building next to an elementary school. The full-time library director at Parsons is the only library employee. Due perhaps to its proximity to an elementary school, the Parsons library has a particularly strong focus on children's programming, hosting school groups several days a week.

Fig. 4. The Bellgrove Public Library. West end, pop. <900.

Fig. 5. The Parsons Public Library. Central, pop. <1,000.

*3.4.4 Wheaton.* Wheaton is the largest town and county seat of Fairmont County, with a population under 4,000, located on the east end of the county. In contrast to the other towns where I conducted fieldwork, Wheaton has a downtown area featuring a business district, community college, and performing arts center, as well as suburbs with strip malls containing businesses like Walmart and grocery stores. The Wheaton library (Figures 6 and 7), officially called the Fairmont County Public Library, is a 13,500 sq ft building with floor to ceiling windows overlooking downtown Wheaton. While I do not have firsthand data on the staffing of the library in Wheaton, the Institute of Museum and Library Services Public Libraries Survey (IMLS PLS) for 2021 reports that this library has 5.08 full-time equivalent employees (all other libraries in the county have less than 2) [1].

Fig. 6. The view of the Fairmont County Public Library when entering the library grounds from downtown Wheaton. East end, pop. <4,000.

Fig. 7. The Fairmont County Public Library front entrance. East end, pop. <4,000.

*3.4.5 Thurman.* Thurman is a town of less than 1,600 people on the outskirts of Wheaton. The Thurman Public Library (Figure 8) is a two-room building. In addition to the full-time library director, Thurman has two part-time staff members. The Thurman library director has demonstrated

Fig. 8. The Thurman Public Library. East end, pop. <1,600.

Fig. 9. The Hillmere Public Library. East end, pop. <2,200.

a particular proclivity for technology. When I first met with her in 2022, she showed me "maker kits" that they were lending out to local kids to help them develop STEM skills associated with engineering. She has also discussed wanting to start a coding club for kids in the area.

*3.4.6 Hillmere.* Hillmere has a population just under 2,200 and is located on the east end of Fairmont County. Hillmere is home to the upscale golf resort, Lockewood Resort, which sits on 11,000 acres of land in Hillmere. In addition to "short-term" tourism at the hotel, Lockewood Resort also has gated communities with second home and/or retiree real estate, dividing Hillmere between "true" locals and permanent tourists. Lockewood Resort is also home to a decommissioned military bunker that was created for use by congress during the cold war. With its historical, physical, and economic prominence, Lockewood Resort is an imposing force in the Hillmere community. The Hillmere library (Figure 9) has a room with their collections, computers, tables, and a fireplace. They also have an additional community room that sometimes features temporary exhibits and is available to be reserved by community members for events. The Hillmere library has two part-time library staff members in addition to the full-time library director.

## 4 Findings

Differences between towns in Fairmont County, WV are visible and stark. Interviews with participants highlighted perceptions of differences between the western end and eastern end of the county. Wheaton and Hillmere, two towns with significantly more economic power than other towns in the county, are both located on the eastern end of the county. By contrast, the other towns in the county, particularly those on the west end, over the mountain ridge, have faced steady economic decline over the last 50 years. Even the weather changes at the midpoint of the county, as M5, the library director in Meadowville noted, *"You hit that line and come back from Wheaton and it's clear, and you hit [the midpoint of the county] and you might be in a whiteout. It's really strange. It really can be drastic."* The east/west divide was summed up by a participant from a small town on the eastern end of the county, *"That's at the west end of the county. It's like another world."*

Impacts of the intra-rural digital divide between different towns in the county span domains of access, use, skills, and experience. Participants throughout the county had varying interest levels with computers and technology, with no strong themes emerging around stronger interest on one end of the county over another. Results from a demographic questionnaire administered to participants indicated that 23 participants had internet at home while six did not (one participant declined to answer). The six who did not have internet at home lived in towns throughout the county. Two lived on the east end of the county, in Hillmere and Thurman, one lived on the west end of the county in Bellgrove, and three lived in the center of the county in Parsons. Some of

these participants shared in interviews that they wanted internet access at home but it was either prohibitively expensive or unavailable. Others stated that they did not see a need in their lives for home internet. Of the six participants who did not have home internet, five still reported that they used the internet at least a few days a week. All but one participant with internet access at home reported using the internet on a daily basis. The 23 participants with home internet access lived in towns throughout the county, including all six research sites. Among participants who did have internet access, many reported that it was slow or costly (and oftentimes both), even for those living in Wheaton. Therefore, it seems that participants throughout the county faced challenges getting good home internet. Still, participants on different ends of the county did indicate ways in which their experiences with technology differed, pointing to geographically-aligned intra-rural divides hidden within the broader digital development issues impacting the area.

In this section I describe the presence and impacts of intra-rural digital divides I observed at my fieldsites and learned about through interviews with participants. I describe the material intra-rural divides present between towns in terms of economic and computing resources, as well as industry and economy. I then discuss local public librarians' efforts to create more equitable social and digital experiences for residents throughout the county.

### 4.1 Intra-Rural Digital Divides: East vs. West

Intra-rural digital access divides most obviously manifest in disparities between the east and west end of the county where I conducted this work. Comparing the experiences of H30 and M1, two technology enthusiasts from opposite ends of the county, helps to demonstrate this. H30 and M1 both exhibited a particularly high level of interest and skill with technology. Both had experience with programming. H30 set up his home computer to dual-boot so he could use both Linux and Windows. M1 had extensive experience with computing technology for his education and work and is a technology hobbyist in retirement. He described buying discontinued Xbox Kinect hardware on eBay and setting it up for animation and 3D character modeling. H30, who participated as a current library staff member in Hillmere, described his experience with technology growing up in Wheaton,

> I guess I feel like I was having the normal teen experience, downloading things off of LimeWire and getting on MSN Messenger. - H30, Hillmere/Wheaton

He went on to remark that his experience using internet in Minneapolis, where he went to college, was worse than his experience with internet in Wheaton and Hillmere.

M1 lives in Meadowville and reported a vastly different experience with internet,

> As far as on the tech side, that's a big impediment because the broadband communication is so poor that our internet throttles, and even if you go to a new web page, it'll come out and say, "You can't find the page." ... And then I'll have to refresh it. It's just about on par with dial-up. - M1, Meadowville

Here, he describes how his internet is often too slow to even load a webpage. He relies on the internet at the public library for more computationally intensive tasks, like video conferences. He has even had to develop a method for bypassing Windows updates because they will run too slowly on his home internet. Once a month, he brings his desktop computer into the library to run updates. H30 and M1's comparative experiences exemplify differentiated experiences with internet infrastructure that came up throughout participant interviews.

W18, an information technology (IT) employee at the community college and technical school in Wheaton, reinforced H30 and M1's experiences through speculation drawing from his experience working and living throughout Fairmont County and neighboring counties. In his estimation, Wheaton and the surrounding area benefits from the more robust infrastructure put in place to

support the community college and other key institutions in Wheaton (e.g., government buildings). One potential reason for the discrepancy in internet speed between the east and west end is the lower population on the west end of the county. W18 drew from his experience working for a telecommunications company to explain how less populous areas are often deprioritized or overlooked for stronger internet connection deployments,

> I worked in telecom as a supervisor for a call center. A lot of it has to do with financial gains from the companies. If there's not enough customers in an area for them to justify the cost of running, say, fiber optic, then they won't do it...There are quite a few grants that I've seen come out from the federal government for upgrades of the infrastructure. But those are all generally geared towards X amount of people by the end of, say, a year, so then they focus their efforts on higher-density population centers. - W18, Wheaton

Neglect of lower population areas can become a cyclical issue, where services are denied to an area due to low population, which in turn decreases the appeal of the area for new residents.

With participants throughout the county lacking home internet due to issues with access and affordability, public access points are important for affording internet access to local residents. To this end, a Wheaton coffee shop, the Mystic Mug[5], is an important fixture in the community. During my fieldwork, I found that, aside from the public libraries, the Mystic Mug was the only business in the area where I had internet connection and outlet access to plug in my computer, and I observed many others taking advantage of the internet connection for education and work. A participant from Wheaton echoed this experience:

> Before this, I was a programmer for about six months, just totally freelance, and you pick up work here and there. And I would come out and try to find somewhere to set up, and the [Mystic Mug] was always where I landed. I mean, [laughter] but I'd have to go get two more hours of internet all the time. - W20, Wheaton

W20 is referencing The Mystic Mug's internet business model. With each cafe purchase, customers receive a voucher for two hours of free internet. To continue to use the internet once the voucher expires, customers must either make another cafe purchase to get another two hours of internet or pay for internet access directly through the cafe's website. Therefore, the cafe's internet is not free and publicly accessible the way that the libraries' internet is. Additionally, the cafe's connection was occasionally unstable. One day when I was trying to work from the cafe, my voucher code was rejected due to a system error and I was locked out of accessing the internet due to too many invalid voucher code entries. The internet speed was also variable. On one occasion, I took a speed test which reported a download speed of 0.04 Mbps. To put this in perspective, the FCC defines broadband internet as having download speeds of at least 25 Mbps. Therefore, while Wheaton does have technological and business advantages over other areas of the county, it still has technological disadvantages compared to typical experiences of internet access and use in less rural areas in the United States.

### 4.2 Industry and Economy: Overlooked Locals and High-Tech Outsiders

One of the most obvious differences between the east and west ends of the county is the economic and business disparity. Most towns, aside from Wheaton, do not have a grocery store, let alone more extensive shopping options. Several participants noted the negative impact that the presence, and departure, of the coal mining and logging industries have had on the west end. The departures of these industries impacted the local labor force, leaving many out of work and without the technology skills needed to obtain office work or remote work opportunities. On the east end,

[5]Pseudonym

Wheaton holds political power as the county seat of Fairmont, as well as economic power as seen through its business district, full of upscale boutiques that some participants have designated "tourist shops." Participants also noted Wheaton's focus on education and arts as it is home to the county's community college and performing arts center. Hillmere also has significant economic power through the upscale golf resort located there, Lockewood Resort. Lockewood Resort, established in the 1700s, sits on 11,000 acres of land and includes dedicated real estate which most participants recognized as being used for second homes for frequent Lockewood Resort visitors. Although Wheaton and Hillmere are distinct communities, they seem to have something of a symbiotic relationship. Shop and restaurant owners in Wheaton cater their wares to the upscale tourist audience of Lockewood Resort. Wheaton's reputation as "America's Coolest Small Town" (as voted in a Budget Travel magazine poll about ten years ago) is also a likely draw for potential second homeowners at Lockewood Resort, adding to the reputation and appeal of Lockewood Resort in Hillmere. A history of extractive industries in the west end seem to have had lasting impacts of economic hardship and digital underdevelopment. Simultaneously, initiatives like relocation incentive program Ascend WV (located on the east end of the county), invest in bringing tech workers into the area. Tensions and contrasts in industry and opportunity between parts of the county and "locals" vs. "outsiders" contribute to first- and second-level intra-rural digital divides through uneven investment in local skills and access.

Fairmont County is one of the areas featured by Ascend WV, a remote work incentive program that offers remote workers $12,000 to relocate to the state for two years. In conversations with program leadership, Ascend WV described their positive benefit on the local area through the economic stimulation remote workers brought in. While some local residents I spoke to thought Ascend WV was beneficial to the community, others questioned why focus was placed on bringing in outside talent, rather than training local individuals and taking advantage of local assets. W19, the lead technician of a local tech support service provided a nuanced perspective on Ascend WV, highlighting some of the positives he believes they have brought to the area,

> It's double sided, I think. I think it's good because they might have a little bit more money than most people around here, so it's good because they'll pay for our services. But also, I have heard back and forth some people are like, "Well, if they're coming in and taking a lot of jobs–" and this and that. But I don't think that's the case. I've gotten the chance to speak with a lot of those people, and they are bringing in particular jobs that aren't existing, and they're providing companies, too, so they're actually creating more jobs for people. - W19, Wheaton

He pushes back on local narratives that Ascend WV remote workers take employment away from locals. However, it is worth noting that Ascend WV highlights local job listings on their website for family members who may be joining remote workers in their Ascend WV relocation.

T23 noted that her own children left the state after college due to a lack of work opportunities, connecting that to a perceived investment from the local government in outside talent rather than locals,

> My son's the only one that stayed in the state after he graduated college. My daughters both left. Now, my oldest one's back. She works at the prison. But with all her experience and her degree, she had a hard time getting a job here. Then, the governor [] encouraged people to move here [] to do online things. So you've got people with skills moving into the state. The people in the state haven't been taught those skills. - T23, Thurman

T23 highlights multiple issues stemming from a perceived lack of investment in local assets. First, she highlights the issue of local residents having difficulty finding work, even with the benefits of

college degrees and prior experience. Then, she notes the investment that is being put into bringing outsiders to the area rather than cultivating local residents' skills.

In my own observations, I found additional intra-rural inequities in digital access related to Ascend WV's office space in Wheaton. As previously noted, the public WiFi experience in the area can be somewhat unreliable. As part of Ascend WV's relocation incentive package, remote workers are offered a remote work office space that looks similar to the high tech office spaces of Silicon Valley tech giants. It also has a private WiFi network for workers with high speeds offered through a service provider that is prohibitively expensive for most local residents.

### 4.3 Public Librarians as Community Advocates and Equalizers

The public libraries of Fairmont County are key drivers in breaking down digital inequity between towns. When I began working in these communities in 2021, disparities were present in computing infrastructure between libraries. Now, all the computing infrastructure has been standardized across the libraries, with all libraries recently receiving new computers and iPads and an upgraded WiFi network. Prior to the introduction of the new unified WiFi network, speeds at the west end libraries were often too slow to be captured on an internet speed test. When we did capture speeds, they were typically reported to be <1 Mbps. In contrast, speeds at the east end libraries in Wheaton and Hillmere were noticeably faster, in the 10-30 Mbps range. On the new network, speed tests reported consistent speeds in the 80-100 Mbps range, well above the FCC's broadband definition of 25 Mbps, across all the libraries.

Amidst recognitions of the east/west county rivalry among residents, the library directors of each branch indicated that this rivalry does not extend to the librarians, whom they described as having their own community. As the library director in Thurman, a small town on the east end, described,

> All the libraries are not like the people in the community. ... We collaborate. We have meetings where we discuss and improve each of our things and talk. Yeah, libraries are I guess like doctors and nurses. We work together. Not against each other. We work together. - T23, Thurman

T23 describes how the libraries do not compete with one another, instead collaborating and working together to improve their services overall. The library director in Hillmere corroborated this sentiment and shared an example of a time when another library helped her when she faced staffing shortages,

> Libraries in general, we are not big on, "Let's put the other guy out of business, or laugh at the other guy" ... For instance, I mean, one of the problems I was just facing when I suddenly lost an employee, it was like, "I need somebody to watch the desk for story time because I have a meeting." And fortunately, my colleagues at Wheaton and whatnot put their heads together and said, "Okay. We'll send this person over. You can come to the meeting." So yeah. We believe in helping each other out. - H28, Hillmere

The library director at Hillmere further elaborated on how libraries do not compete with one another, describing how having multiple, small libraries in the county provides benefit to residents, such as availability of popular books. While the wait list at Wheaton for a bestseller may be weeks or months long, smaller libraries in the system may have that book on hand with no wait. Different libraries, like the communities they are housed within, have different advantages and assets.

The library director at Parsons described how she encourages patrons to visit other libraries in the county to take advantage of their programming, book selection, or staff expertise,

> If [my patrons] come in here and ask a question, they'd feel comfortable asking that question, but they don't feel comfortable at a big library asking the questions. I think

> they feel more like that they don't equal. ... But the Fairmont County Library, they got some amazing workers up there. I would call and ask them anything. I wouldn't be embarrassed to ask them anything. And that's what I portray to my patrons. That they got a wonderful staff up there and very helpful staff. So make yourself feel comfortable enough to ask something if you need to, and I guarantee you, you'll be retreated with respect. And so I've got quite a few that have went up there since then to get books and stuff. ... And it all boils back down to us being good with each other as a community of helping each library. - P15, Parsons

Here, P15 recognizes the unique value that small rural libraries hold for their communities, while also highlighting how she leverages the broader network of libraries to access additional resources and opportunities for herself and her patrons. P15 also shared how cross-community library patronage goes the other way as well, with Wheaton residents visiting her library. P15's experience of libraries transcending intra-county tensions was reinforced by participants in their use of libraries outside of their hometowns. For example, because the Wheaton library did not host research activities, people from Wheaton participated at other libraries.

Of the six libraries in Fairmont County, the Fairmont County Public Library based out of Wheaton was the only one that chose not to participate and host research activities. A number of factors may have contributed to lack of participation from Wheaton: miscommunication and misunderstanding about the research project, lack of time from the library staff to help facilitate the research, or lack of expected interest from the patrons of the library system, to name a few. However, I believe that all of these reasons boil down to one overarching fact. Of all the libraries in Fairmont County, Wheaton stands to gain the least by participating. All other libraries I worked with had similar reasons not to participate. Libraries I worked with were understaffed and strapped for time. They warned me that participation rates might be low, based on their experiences running programming. They put considerable effort into working with me to learn about and support this work. I believe they invested that time because the risk of closure is always on the horizon for small, rural public libraries, as some librarians spoke about in interviews. Programming I hosted at the library as part of this work helped to increase traffic in the library and can be a talking point with their boards and funders to help justify their continued existence. As the largest library in the county, Wheaton is the most secure. They do not experience the same looming risk of closure or financial loss that the other libraries do. Therefore, the effort that goes into participating in an ongoing research engagement was likely not worth the potential benefits. I do not blame them for this or cast any negative judgment on them for this choice. It does, however, underscore the dynamics between different towns in this county and the intra-rural divides in economy and power between them.

Throughout my fieldwork, I observed the important role that small, rural public libraries serve within their own communities. As the library director in Bellgrove described it, *"we don't just do books, we do community."* She organizes monthly community programming like quilt and art shows with receptions and prizes. She described this programming as a bright spot in the community in contrast with the "depressing" way she sees the town going amidst business closures and drug use related to the opioid crisis. The library is a space of local resistance against the neglect and exploitation that the area faces through external forces, such as the state-facilitated opioid epidemic [61]. The library director in Parsons similarly described how the equality of public libraries and "third place" role that the library serves is crucial for those who have no other place to go. She described how a community member who was experiencing homelessness had a reputation for stealing that led him to be banned from businesses in the area like the Dollar General. She continued to welcome him at the library, noting that it was the only place he could get internet access. These

examples help to highlight the important community role of small, rural public libraries in areas where other businesses and third places may not be available.

## 5 Discussion

Through fieldwork in different towns within one rural county, I observed intra-rural digital divides in the form of differentiated digital access, skills, and outcomes between residents of different towns. Differentiated access largely occurred in alignment with geographic and socioeconomic divides between the east and west sides of the county. Further, digital access, skills, and outcomes also appeared to be differentiated based on socioeconomic and sociocultural factors of longtime local residents and newcomers to the area. These observed intra-rural digital divides existed within broader rural-urban digital divides, with residents throughout the county experiencing impacts of digital inequity such as a lack of affordable, high-speed home internet.

Public libraries and library staff are key assets in the communities where I conducted this work. Public library staff held dual-roles as advocates for their own towns and members of a broader community of librarians. In these dual-roles, librarians are effective change-makers because of their close relationships to local communities alongside their access to a larger organization with greater resources to address needs. From the perspective of intra-rural digital divides, I found that public libraries worked together to resolve digital inequity throughout the county, for example, by implementing equal computing infrastructure in each library. In doing so, these libraries drove impactful change in their communities, despite challenges stemming from under-resourcing.

### 5.1 Mapping a Framework for Intra-Rural Digital Divides

Identified intra-rural digital divides in this work aligned with different dimensions of digital divides and rurality. In section 4.1, two participants with similarly robust digital skills and interest shared differentiated experiences due to a geographical first-level digital access divide. In section 4.2, I describe how residents perceived sociocultural second- and third-level digital skills and outcomes divides between longtime local residents and "outsider" newcomer residents. Based on these findings, and a review of the prior literature on intra-rural digital divides, I have developed a framework to map different dimensions of intra-rural digital divides that have been explored in the literature up to this point (Figure 10). In analyzing the existing body of literature on intra-rural digital divides, it became clear that prior work has defined such divides along three primary dimensions: intra-rural (i.e., what factors predict the divides), digital (i.e., what kinds of divides occur), and scope (i.e., if divides exist between individuals of the same communities, or between different rural communities). Once these dimensions emerged from the literature, I began to develop sub-dimensions to explicate factors that have been under consideration in this research area.

The process of developing these sub-dimensions from the prior literature was akin to thematic analysis. My first level of analysis was similar to descriptive coding [72], and entailed reviewing the prior literature to identify factors by which intra-rural digital divides had been defined. For example, some prior literature identified education level as a factor that predicted differentiated digital use between rural residents. Once I had a list of these factors, I began a second-level analysis process to group these factors into broader themes, which became the sub-dimensions of the framework. At this stage, for example, education level was grouped into the socioeconomic sub-dimension with factors such as individuals' occupation and communities' economic growth. The listed sub-dimensions do not cover the full spectrum of possibilities, but represent factors that have been discussed in prior literature thus far.

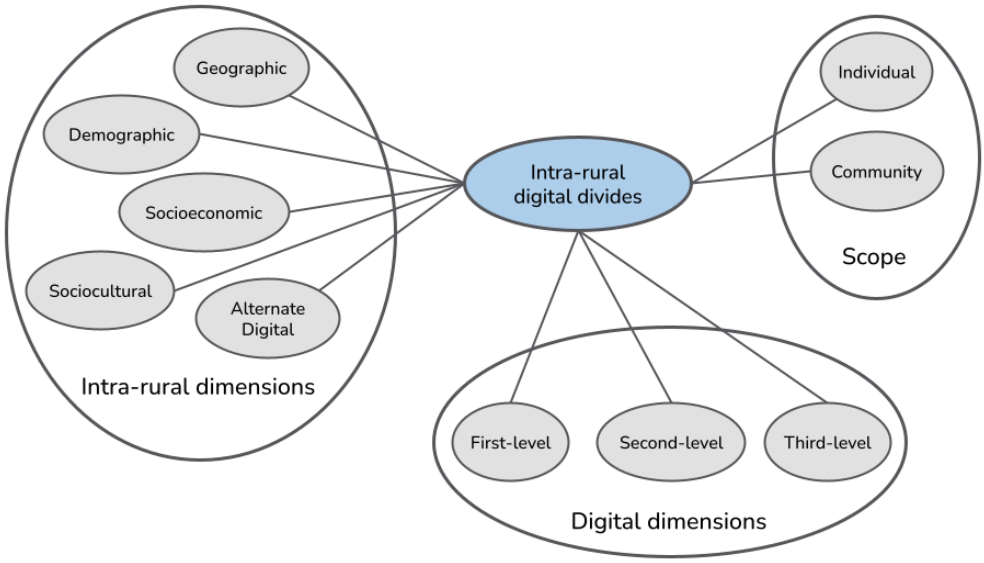


Fig. 10. A diagram mapping three dimensions by which intra-rural digital divides can be defined (intra-rural, digital, scope), and sub-dimensions within these

Prior work has identified intra-rural digital divides aligned with factors of first- [30], second- [8, 9, 42, 89, 90], and third-level [19, 42] digital divides, a layer of intra-rural digital divides depicted in Figure 10 as "digital dimensions."

These identified divides have been rooted in different explanatory factors, described in Figure 10 as "intra-rural dimensions." The majority of prior work on intra-rural digital divides has aligned identified digital divides with socioeconomic factors, such as education [8, 9, 19, 90], occupation [8, 9, 19, 42], and community population/economic growth [19]. Another prominent factor has been demographics, with intra-rural divides characterized by age [8, 19] and gender [42]. As I have also demonstrated in section 4.1, intra-rural digital divides can occur geographically, with differentiated digital access between different geographic locales [19, 30]. The last two sub-dimensions depicted in Figure 10 have, thus far, received limited attention in prior literature. Kahn and Burrell depicted intra-rural digital divides aligned with sociocultural factors [42], such as rural-origin or urban-transplant status, a factor I also discuss in section 4.2. Botsiou & Koutsou identified alternate digital factors as significant explanatory factors when evaluating rural farmers' usage of the Internet [9], for example, finding that ownership of ICT devices was predictive of certain types of ICT usage.

Finally, prior work has considered intra-rural digital divides at both the individual [8, 9, 19, 42, 89, 90] and community [19, 30] level, described as "scope" in Figure 10. At the individual level, intra-rural digital divide research has explored digital disparities between different residents of the same, or similar, communities, highlighting how individual factors can create differentiated experiences in the same environment. Other work has considered intra-rural digital divides at the community level, looking at how digital factors align with a given area, shaping the digital experiences of the residents. In my work here, I have attempted to explore intra-rural digital divides at both the individual and community levels, aligning observed trends with geographic areas and considering individual factors that appear to influence digital experiences.

While I depict the sub-dimensions of each dimension grouping as separate, these different factors are inherently intertwined with one another and often overlap. For example, prior digital divide research has identified correlations between demographic factors, such as age, and digital literacy, a key factor of second-level digital divides [7]. Thus, it may be difficult to untangle if identified intra-rural digital divides occur on the basis of demographic intra-rural dimensions, or second-level digital dimensions, as these factors are closely linked. In the findings discussed throughout section 4, I demonstrate how the factors in this framework can overlap and intersect, complicating simple depictions of digital divides as a binary of haves and have-nots or singular explanatory factors. For example, while I did identify broad community-based divides between the east and west ends of the county (section 4.1), disparities in digital access, experience, use, skills, and outcomes did not always map neatly to town borders. Divides often manifested at the individual level, affecting individual residents differently. The findings discussed in section 4.1 and the framework depicted in Figure 10 demonstrate how digital divides are not a clean binary of haves and have-nots, but a complex matrix of varying factors that manifest differently depending on nuances of different individual experience and context. Importantly, many of these factors are more localized than can be gleaned from high-level designations, leading to hidden intra-rural digital divides that can only be addressed through local, bottom-up strategies, as I will discuss in section 5.2.

This framework for characterizing intra-rural digital divides provides an initial attempt to map and codify this phenomenon so that existing dimensions are made more visible and future work can orient more easily to the existing body of literature. Future CSCW, HCI, and digital divide researchers can use this framework to develop methodologies for intra-rural digital divide research focused around varying sub-dimensions of interest to their chosen context. By explicating the factors of this phenomenon that have been explored so far, researchers can make more intentional decisions around areas of focus in future digital divide research. Further, future research should iterate upon this framework, identifying unexplored dimensions to add new perspectives to the scope of research.

### 5.2 Public Libraries as Community Assets for Intra-Rural Digital Equity

The cultural and historical context of Appalachia and the prevalence of deficit-based perceptions of the region warrant the use of community-driven, assets-based approaches to digital equity [20]. At my research sites, public libraries and their staff invested in bettering their local communities through promoting digital equity, diffusing social tensions, and serving as a "third place" to residents, particularly those with nowhere else to go (section 4.3). Through this investment in bettering local conditions, libraries demonstrated their capacities as key assets in the community, with particular relevance for intra-rural digital equity and inclusion. Public libraries have a long-established role in digital equity and inclusion policy in the US [52, 63]. Libaries' foundational value of equality and equal access is often thought of at the individual library level, with each library providing equal access to information resources (such as internet and e-government services) to all members of their community, regardless of socioeconomic factors or other individual characteristics that can be used deny them access in other settings [5, 41, 75]. Building upon this conceptualization, I observed the value of equality extending to the community level, with libraries working towards inter-library equality. In this way, rural public libraries can serve as a key asset for resolving intra-rural digital divides.

The libraries in Fairmont County created material benefit throughout the county by providing improved internet and computing infrastructure in each library. Due to recent deployments of improved computing hardware and WiFi, the experience of library technology use is now equivalent across all libraries in the county (section 4.3), with two key implications for digital inclusion. First, high-speed internet and updated computing hardware helps to make ICTs accessible to residents

throughout the county who may otherwise not have access, helping to reduce the impacts of digital access divides in this area. Secondly, equivalent computing infrastructure at all libraries creates an equivalent experience of use that can serve as a counter-narrative to residents' experiences of resource disparities between the two sides of the county. In addition to the benefits of material computing resources provided by the libraries, librarians use their role as key figures within their communities to diffuse social tension between residents of different towns, promoting community cohesion [28, 44]. Libraries are hyper-local institutions, reflective of their unique contexts and communities [44]. Librarians in Fairmont County recognized the unique assets and identities of each community and library, encouraging their patrons to step outside their comfort zone to take advantage of benefits offered in different towns. While librarians, then, are first and foremost advocates within their local communities, their part in the overarching community of libraries results in greater digital inclusion and social cohesion throughout the county [28, 44]. This can facilitate intra-rural digital equity by making existing disparities between closely located communities visible and addressing these disparities equitably, such that improvements are the greatest for those most acutely impacted. This can help to minimize the risk that efforts to close rural-urban digital divides would overlook certain communities or residents as these stakeholders have advocates on their side who are seeing the big picture: local libraries and librarians.

Still, libraries are limited in promoting digital equity, as public computing use has limitations compared with home use [70]. On public access computers and internet, like those at the library, individuals may feel constrained to engage in only necessary digital activities, without room for exploration and play that can help to develop digital literacy [70]. Prior work on assets-based approaches in HCI has noted how assets exist within, and can be constrained by, larger-system issues [25]. The public libraries of Fairmont County are key community assets in multiple ways, and are limited by the constraints of larger systems. Rural public libraries are already under-resourced and need more support if they are to effectively leverage their status and roles to achieve greater digital inclusion [64, 98]. However, larger systems for digital equity seem to be regressing, for example, with the shutdown of the Affordable Connectivity Program in the US [2].

While libraries are limited in how directly and extensively they can resolve local digital divides, their approach to resolving digital inequity can be utilized as a framework for addressing intra-rural digital divides alongside broader digital divides. The libraries' actions demonstrate how the broader digital divide impacting Fairmont County can be more effectively resolved if intra-rural digital divides are taken into account. Taking stock of the digital experience of each library in the county and investing equitably between them all has helped to level disparities between different libraries, while simultaneously improving internet and computing resources at each one. For example, with the new WiFi network deployed at the public libraries, the improvement was the smallest at the largest library, which had the highest internet speed before changes were made. However, internet speeds still increased across all libraries. In this way, accounting for the specific realities of each area and making equitable improvements levels both intra-rural and broader digital divides. This approach to digital development avoids overlooking certain areas and consequently widening intra-rural disparities as broader divides appear to shrink.

The libraries of Fairmont County are assets not only in their material offerings, but also in the framework through which they create equitable change. Librarians' rich local knowledge makes them an ideal asset to leverage in addressing issues faced by the community [44]. For example, Kozubaev and DiSalvo [44] suggest that librarians could serve as crucial connection points between residents in crisis and support services. Here, I suggest that libraries may utilize this knowledge and role in aiding the resolution of hyper-local digital inequity. In advocating for individual communities where they hold close relationships, while also engaging with the larger library system and associated resources, libraries have both the birds-eye and close-up views needed

to resolve localized intra-rural inequality and broader digital divides impacting the area. However, under constant stress of under-resourcing and threat of closure, library staff are stretched too thin to leverage this unique role for greater community benefit [64, 98]. Rural libraries and librarians are key assets for digital inclusion and should be supported accordingly so they can be leveraged most effectively to diffuse both rural-urban and intra-rural digital divides impacting their communities.

## 6 Conclusion

In this paper, I have illustrated the presence and impacts of intra-rural digital divides between six rural towns located in one county. In doing so, I have contributed a new framework for conceptualizing intra-rural digital divides. This framework can inform digital development efforts by advocating for equity with more granularity and nuance than can be achieved through high-level considerations of the digital divide. In working with rural public librarians, I found that they used their dual-roles as community advocates and and members of the broader network of libraries to address intra-rural digital divides. Their role as community advocates gave them rich context regarding the specific needs and assets of their local community. Being a part of a broader network of libraries allowed them to compare their experiences against those of neighboring communities, and to access collective resources to address issues. Therefore, I suggest that intra-rural digital equity might be driven by public libraries in rural areas throughout the United States. To take full advantage of this potential for public libraries to be a driving force in resolving intra-rural digital inequity, public libraries should receive increased funding and staffing to support digital development initiatives.

## A Semi-Structured Interview Guide

| **Questions** |
|---|
| How long have you lived in {your town}? |
| What are your favorite things about living in {your town}? Least favorite? |
| What do you usually come to the library for? Do you use computers/internet at the library? |
| What technology devices do you use regularly, e.g., computer, phone, tablet? |
| If no smartphone, why not? |
| How often do you use {these devices}? |
| Where do you use computers, e.g., at home, work, library? |
| In the past week, what have you used a computer for, e.g., work, social media? |
| In the past week what have you used your phone for, e.g., social media, directions, email? |
| What problems do you run into when using the internet/your computer/your phone for ___? |
| How would you describe your computer skills, e.g., beginner, expert? |
| What does it mean to you to have computer skills? |
| What would you need to be able to do or know to consider yourself good with computers? |
| When do you remember first using a computer? What was that like? |
| What would you like to be able to do with a computer or smartphone? (What do you wish you were able to do with a computer or smartphone?) |
| If you were to try to learn how to do _____, what would you do? |
| Have you ever had to leave your town to get good internet/new tech device/education/work? |
| Why do you think X town has Y, but you don't have that here? |
| How might your experience with computers/internet be different if you lived somewhere else? |
| Do you consider X town as part of your community? What do you consider as part of your community? (e.g. surrounding towns, specific locations in nearby towns like church) |
| What do you wish outsiders to your town/community knew about it? If you could change something about your town, what would it be? |

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