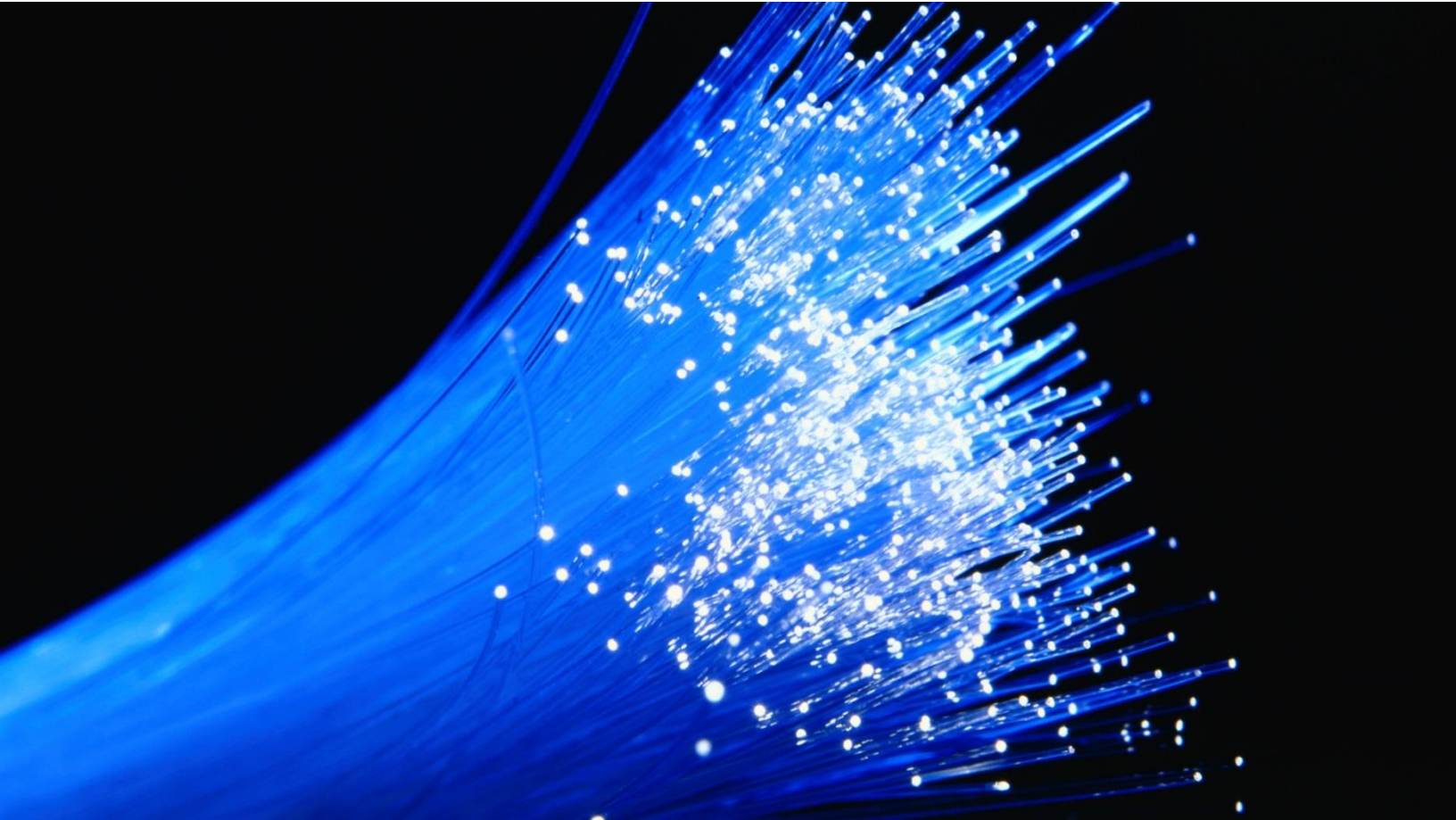# ctc technology & energy

engineering & business consulting

Digital Equity Strategic Plan
Prepared for ConnectWaukegan
April 2022

Executive summary

This digital equity strategic plan prepared for ConnectWaukegan makes clear that the dominant issues with respect to broadband in Waukegan center not around lack of infrastructure (ubiquitous Comcast cable service exists, at least within the City) but around barriers to connectivity—particularly difficulties in enrolling in the available low-cost and subsidy programs, as well as substantial device and skills gaps.

This plan arrives at a critical moment in terms of a national overhaul in broadband policy and funding. The data and strategic recommendations presented here are designed to help ConnectWaukegan and its constituent members—public sector and nonprofit—realize the potential of this funding to the fullest extent possible. This report may also serve to indirectly assist the Illinois Office of Broadband in clarifying how it can design programs to effectively reach those in need in Waukegan, and potentially other communities with similar connectivity barriers around the state.

Indeed, Waukegan is a prime example of the kind of community for which recent federal broadband funding sources can potentially provide transformational assistance: It is a rebounding city with large numbers of low-income residents and immigrants facing steep challenges in affording broadband, maintaining devices, and making the most effective use of broadband. The

> ### About ConnectWaukegan
> ConnectWaukegan, formerly known as the Waukegan Community Broadband Taskforce or WCBT, is an organization of public and private entities committed to ensuring that all residents, businesses, and institutions in Waukegan have access to high-speed broadband and possess the devices and skills needed to put this connectivity to effective use. ConnectWaukegan is in the process of incorporating itself as a 501C3 nonprofit. The members of ConnectWaukegan, as of April 2022, are identified in Appendix G.

City is fortunate not only in having new residents bringing vigor into the community, but in having a dedicated group of nonprofit and public sector entities—ConnectWaukegan—deeply engaged in understanding and closing broadband gaps of all kinds. Achieving digital equity means not only ensuring the availability of broadband services, but also ensuring that those services are affordable and that all members of the community have both the skills necessary to make effective use of broadband and access to well-functioning devices.

ConnectWaukegan is already engaged in a variety of initiatives such as device procurement and training programs. It is working to keep abreast of relevant government and internet service provider (ISP) programs, and the imminent infusions of federal monies. In late 2022 there exists enormous potential to deploy funding to community members who need and deserve this help, facilitated by members of a strong organization well positioned to ensure funds are spent effectively and efficiently. The work done by ConnectWaukegan to date—and efforts by its

members to implement the recommendations outlined in this report—are potentially replicable in similar communities and can potentially serve to catalyze efforts elsewhere. ConnectWaukegan has also expressed a willingness to share information and experiences with other stakeholder groups in Illinois and nationally.

Summary of recommendations

This report's major recommendations, detailed in Section 1, are briefly summarized here:

1. So that it can continue as a leader in driving digital equity and inclusion activities, formalize ConnectWaukegan as a digital inclusion coalition with leadership from involved stakeholder groups. ConnectWaukegan has already led the way on important initiatives, including seeking funding to create a digital navigator staff position to assist low-income residents with enrollment support.

2. In terms of programmatic efforts, the top priority is to maximize residents' enrollment in the federal Affordable Connectivity Program, a $30 monthly subsidy for which a majority of the community is likely eligible. Enrollment complexity coupled by challenges faced by many residents, including language barriers and lack of a social security number, suggest the need for enrollment assistance through "digital navigators" to provide direct assistance. ConnectWaukegan has already facilitated the hiring of one such navigator, Elizabeth Ramirez. In addition to such positions, all entities in Waukegan that interact with potentially eligible residents can assist consumers in enrollment.

3. To drive comprehensive solutions over the long term, engage with local and state partners, including community stakeholders and the Illinois Office of Broadband, to explore and design a model for a community connection center, a bricks-and-mortar facility that will address adoption and utilization with an initial focus on device distribution, tech support, and ACP enrollment support; this also becomes a home base for the digital navigator. Subsequent service additions may include digital literacy classes, workforce training and development, and small business support services.

4. If an engaged stakeholder such as the WCUSD #60, City of Waukegan, or other partner is willing to engage in the matter, consider launching a planning process to explore the feasibility of a fixed wireless deployment to assist households unable to subscribe to existing services. This report contains high-level cost estimates for three fixed wireless deployment scenarios. One of these scenarios would use only school property and fiber and could provide service at speeds meeting the minimum federal definition of broadband, at a cost of $2,745 over five years per student household, using conservative cost assumptions. Actual costs could be lower; either way, expected technology improvements could provide better coverage in the coming years, increasing the financial

feasibility of this approach. The other two scenarios would provide Citywide coverage using a wider range of structures at higher costs because new fiber backhaul would be required.

5. Although ACP enrollments are the highest priority, consider exploring partnerships with Comcast and AT&T for Internet Essentials subscriptions and bulk-purchase agreements for fiber in low-income apartment buildings such as Waukegan Housing Authority properties, if appropriate funding sources are identified. Of note, AT&T's apartment building bulk purchase program could provide fiber service with symmetrical speeds (the same upload as download) at reasonable prices to building having 50 or more units, as described in this report.

Project scope and activities

To inform these recommendations, ConnectWaukegan's independent broadband consultants, CTC Technology & Energy, conducted the following tasks over the past six months:

- Performed local market research to attempt to define as precisely as possible whether—and with which companies—there exist actual gaps in high-speed broadband service availability, so as to clarify whether and where new infrastructure is needed and determined that assumptions of gaps were unfounded. (See Section 2.)

- Developed granular data on broadband gaps of all kinds (availability, affordability, device access, and skills) facilitated by a statistically valid bilingual mail survey and data analysis, providing a data repository to inform initiatives and potentially underpin grant applications and policy suggestions to the Illinois Office of Broadband. (See Section 3.)

- Gathered data from ConnectWaukegan and individual entities on the scale of existing programmatic efforts with respect to enrollment assistance, skills training, and device programs to better understand the magnitude of remaining programmatic gaps. (See Section 4 and Appendix A.)

- Conducted outreach to the existing broadband providers to understand their willingness to partner to forge solutions, such as scaling efforts to enroll thousands of potentially eligible people to the Affordable Connectivity Program (the ACP, described in Section 5.1), engaging in bulk-buy programs, and connecting residents to device and skills programs. (See Section 5.)

- Documented the fast-changing federal funding landscape to identify opportunities and describe how they might apply to Waukegan. (See Section 6.)

- Performed research on urban broadband infrastructure models executed or studied in other cities to assist the Taskforce in understanding models and guide its decision-making process. (See Section 7.)

- Developed three models for a high-level fixed-wireless design and cost estimate—leveraging WCUSD #60 buildings and fiber but also other tall structures in the City—to fill broadband service gaps among students and others who may be reticent to connect to government resources and are now unconnected or using hotspots or Wi-Fi in school parking lots. (See Section 8.)

- Developed a set of comprehensive recommendations for scaling programs, defining local initiatives, and pursuing federal funds distributed through the state. (See Section 1, which is placed first in the report. The recommendations are backed by data from the report; the full data outputs are provided in the body of the report.)

As additional tasks over the course of the engagement (beyond the formal scope of work) CTC:

- Performed market scans outside of Waukegan—in Park City, Beach Park and Gurnee—to review whether broadband infrastructure gaps existed that might be addressed as part of ongoing planning efforts;

- Produced an early report to ConnectWaukegan in the fall of 2021 reporting on the pace at which the Emergency Broadband Benefit (the precursor to the ACP), was actually being used in Waukegan, and recommended that ConnectWaukegan consider undertaking immediate efforts to expand awareness and signup assistance;

- Developed and provided to ConnectWaukegan a report and primer on infrastructure efforts that have been studied or undertaken in other cities by public sector entities such as school districts and public housing authorities, so as to assist ConnectWaukegan in understanding models and potential options;

- Assisted the City of Waukegan on a timely downtown street reconstruction project by providing costs and specifications for installing underground conduit to facilitate future fiber installation, demonstrating how the City can efficiently install fiber infrastructure as part of revitalization efforts (the cost estimation document produced by CTC is contained in Appendix E);

- Coordinated with consultant Bill Coleman of the Benton Institute for Broadband & Society as he began work with the City of Waukegan through the Illinois Office of Broadband's Illinois Connected Communities Program. We understand that this effort is now directed at helping ConnectWaukegan further explore the feasibility of developing a digital community center, as described in one of the recommendations.

Section 1 presents the report's recommendations; it is followed by sections that document the data developed over the course of the study as well as the fixed wireless designs and cost estimate report.

Contents

1   Recommendations

This report arrives at a remarkable moment in which significant federal and state monies have been allocated to fill a range of broadband-related gaps. To address these gaps, we recommend that ConnectWaukegan and community partners embark on an ambitious plan to address urban digital inequity, starting with recommendations outlined here. With leadership and investment, these efforts could position Waukegan to unleash the potential that connectivity and skills can provide.

The Affordable Connectivity Program is significantly underused, suggesting a need to create enrollment support programs. Once connected, residents need access to free or low-cost devices, expanded skills programs, and technical support that enable them to fully access the opportunities broadband provides. For a variety of reasons, some households cannot be connected; for those residents, digital equity may come in the form of an additional free, fixed wireless service that allows them to connect to an open network from their homes. Residents in large, low-income multi-dwelling units (MDUs) owned by the Waukegan Housing Authority or other entity could be served by either a fixed wireless network, or bulk purchases covering all units.

The community survey, stakeholder discussions, and other work done over the course of the study provided overwhelming data and evidence on these points—as described fully in the body of the report. Federal and state funds may be available to support many of these initiatives. (ConnectWaukegan received private support for this study, demonstrating that funds may also be available from private entities to develop solutions in Waukegan. But both private and public engagement and support will be important to move initiatives forward.)

The rules for the grant and subgrant programs are still taking shape, but with that said, we anticipate that all programs or program expansions recommended here will be at least partially fundable. Section 6 provides an overview of the funding landscape.

1.1   Recommendation: Consider repositioning ConnectWaukegan as a digital inclusion coalition of public and private stakeholders and provide ongoing programmatic guidance

To drive forward momentum and guide implementation of solutions on enrollment support, device provision, and skills training, a robust organization is needed that has deep ties to the community and knowledge of the range of solutions and funding opportunities. A recent Benton Institute report noted the value of "digital inclusion coalitions" and "digital equity ecosystems" to help coordinate efforts to bring needed resources into a community.

ConnectWaukegan is already a thriving entity that can serve as this organization. ConnectWaukegan's existence sets Waukegan apart from other communities and can potentially help develop state broadband policy in a way that addresses needs in Waukegan. And the existence of this report and the data it contains further distinguishes Waukegan from most cities. Through ConnectWaukegan's already extensive network of community partners and connectors, ConnectWaukegan can serve has a gathering point for a digital inclusion coalition that can provide critical data, information, and feedback to state offices and policymakers as part of the state planning process.

We understand from Task Force leadership that ConnectWaukegan has already engaged directly with leadership of Illinois Office of Broadband. We recommend using the data from the survey and other information in this report as a tool for demonstrating the needs to the Office in your continued engagement. This work could both help the state shape policies in ways that potentially create funding streams for Waukegan and, in turn, help indirectly support other similarly situated cities in Illinois.

One way to move forward is for ConnectWaukegan to formally become a 501c3 nonprofit. During the pandemic many organizations attempted to fill broadband gaps, but there was no central leadership driving stakeholders to tackle the issues comprehensively. A central organization operating as a nonprofit can provide leadership and also help source and secure potential public and private financial support that may be available to help residents access, adopt and fully utilize broadband. These funds may be most easily directed to a 501c3, so formal organization of nonprofit status can facilitate this. In addition, the formal organization may serve as the financial sponsor for implementing solutions.

ConnectWaukegan has earned a reputation as an organization that gets things done; investment in formalization will set the stage for receipt of future funding. ConnectWaukegan is already participating in dialogue and in resource groups with the State of Illinois Office of Broadband, local legislators, national advocacy groups, as well as with federal agencies. This work may help inform the state and shape policies in ways that potentially create funding streams for Waukegan and, in turn, help indirectly support other similarly situated cities in Illinois.

 ConnectWaukegan has estimated that setting up a 501c3 might cost between $5,000 and $10,000 in legal fees, a small price to pay to be in a position to receive funds to bring aboard a project manager. ConnectWaukegan has estimated first year expense for staff, legal, and other costs could be between $150,000 and $200,000. To demonstrate stakeholder commitment to supporting these initiatives, it may be valuable to see this organization supported by both public and private funding.

1.2 Recommendation: Hire digital navigators and pursue a robust community engagement effort to facilitate expanded enrollment through the ACP and low-cost programs

Many Waukegan residents are unconnected to existing services. Using survey data, 11 percent of respondents indicated they did not have a subscription to a wireline home internet service. Extrapolating this figure to all Waukegan households suggests that at least 3,200 Waukegan households currently rely exclusively on mobile internet services or have no home internet service at all. These figures may understate the connectivity gap, given information we received from ConnectWaukegan stakeholders that some families are doubled up in housing units. Three percent of survey respondents indicated they did not subscribe to any internet service, suggesting that roughly 900 Waukegan households are currently unconnected to any service.

Our recommended top priority is that ConnectWaukegan and other entities in Waukegan expand ACP outreach and enrollment support as widely as possible. The ACP is one of four existing programs designed to provide relief from high broadband bills to low-income households. Comcast's Internet Essentials, AT&T's "Access from AT&T," and the federal government's Lifeline program also offer subsidies or discounted broadband services.

Each of these programs presents hurdles to enrollment and those hurdles result in low participation rates. In one glaring datapoint, the survey found that only 35 percent of respondents who had an annual household income of under $25,000—and were subscribed to Comcast service—were enrolled in Internet Essentials. Similarly, approximately 79 percent of likely ACP-eligible households in Waukegan were not enrolled in the program as of March 1, 2022.[1] [2] [3][4]

Additionally:

- 60 percent of respondents who reported they did not use the internet said an internet connection was too expensive

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[1] ACP Enrollment and Claims Tracker, USAC. ACP Enrollment and Claims Tracker - Universal Service Administrative Company (usac.org) (Accessed 18 March 2022).

[2] This proportion was calculated using the Universal Service Administration Company's ACP Participation data published March 1, 2022, as compared to the proportion of Waukegan households estimated to earn less than $44,644 per year. Households earning less than $44,644 are below 200% of the federal poverty threshold calculated for the average Waukegan household size of 2.85 according to ACS 2016-2020 5-year estimates.

[3] The most granular level USAC publishes ACP participation at is by Zip Code. CTC collected data from zip codes 60085 and 60087 as they most closely approximated Waukegan's boundaries.

[4] It is important to note that from any potential pool of eligible ACP enrollees—whether by the 200% poverty threshold or other indicators of eligibility—some may already be getting $10 service from Comcast Internet Essentials or Access from AT&T, and others may not have interest in subscribing to any internet service, regardless of cost. Thus, they may not be interested in ACP enrollment.

- 83 percent currently pay more than $40 per month for home internet

- Only 38 percent of respondents who indicated they subscribed to Comcast and reported a household income of less than $25,000 were subscribed to Comcast Internet Essentials, while approximately one third of respondents in this group had not heard about the Internet Essentials program before taking CTC's survey

The federal ACP provides the most cost-effective means to support eligible low-income residents. And we recommend that enrollment efforts exercise caution with respect to using AT&T, because AT&Ts higher-speed services have only a limited footprint in Waukegan; faced with a choice between AT&T and Comcast, Comcast is usually going to be offering the faster service.

ConnectWaukegan shared that in its experience:

- ACP enrollment for residents without a social security number is a multi-step process and has taken as much as four to six hours of support per enrollment.

- ACP enrollment requires a level of computer literacy that many residents lack, including abilities to upload multiple documents and manage email.

- ACP enrollment requires an understanding of federal programs and corresponding documentation that many residents do not understand or find confusing.

For these reasons, merely informing residents of the opportunity is insufficient. A well connected, detail-oriented digital navigator can not only assist with individual enrollments but can also work with local nonprofits to create volunteer enrollment teams to expand the efforts. ConnectWaukegan recently took steps to obtain funding for a digital navigator, Waukegan native Elizabeth Ramirez, who is now employed by ConnectWaukegan and is assisting individuals and groups with direct in-person outreach and enrollment support.

Figure 1 shows Ms. Ramirez, center.

Figure 1: Digital Navigator Assists Waukegan Residents With Enrollment

ConnectWaukegan and its members can also take advantage of their trusted places in the community to develop a multi-channel engagement strategy to provide enrollment support. The greatest impact may come from combining the in-person work of employees such as Ms. Ramirez and the establishment of a central help center that provides intensive enrollment assistance. An outreach and messaging effort tailored to the needs of the community in Waukegan could include:

1. **Develop clear bilingual communications** for fliers, print and radio media, and appropriate customer-service scripts for calls to support both outreach and enrollment. All materials should clearly indicate how residents can receive in-language assistance and materials.[5]

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[5] For example, the FCC produces a "consumer tool kit" with basic information about the ACP in eleven languages. https://www.fcc.gov/acp-consumer-outreach-toolkit (accessed January 27, 2022). Companies like AT&T and Comcast will also often have customer service assistance in some non-English languages.

2. **Incorporate the unique methods that each member organization uses to effectively outreach to the public.** Develop an understanding of how the populations you are trying to reach (such as those signing up for Medicaid or SNAP benefits) typically receive information from local organizations. Mirror the placement and style of these established communication channels. For instance, place flyers about ACP and the sign-up support information in a community center where other assistance program is provided or in a newsletter that already reaches specific communities.

3. **Consider creating an inbound and outbound communications help desk to provide direct one-on-one assistance to households.** The contact number for the existing Digital Navigator position could become the start of a central help line that provides both enrollment support and potentially other assistance as new device and skills programs become available. If this approach is chosen, another option is to contract an established call center with experience working with low-income and limited English-speaking populations. This effort may be a lower priority for ConnectWaukegan now, given the establishment of the Digital Navigator position.

1.3   Recommendation: With local and state partners, explore and design a model of a community connection center that will address adoption and utilization

Abundant data produced by the community survey and articulated by stakeholders in meetings and discussions demonstrate that Waukegan residents have significant needs for skills training, well-functioning devices, and technical support to take advantage of online opportunities and resources ranging from remote learning, telehealth appointments, and workforce development to skills training and applying for benefits.

Survey results documented the following:

- 31 percent of households earning under $25,000 per year lack a desktop computer, laptop, or tablet

- Households with an annual income of less than $25,000 are significantly more likely to rely only on a school-issued Chromebook than are higher income households

- One-fourth of low-income respondents (earning under $25,000 per year) said they would not be able to replace a lost or damaged computer in the foreseeable future, and another 51 percent said it would take one to six months.

- Fifty percent of households would like to be more confident users of the internet, and most are interested in attending training

- Many parents, especially those in lower income households, do not believe their children have the skills necessary to avoid online harms such as bullying, pornography, and/or false or misleading information.

Residents have a desire to improve not only their access to home internet, but their ability to effectively use it as a resource. Residents also have connectivity gaps. And our stakeholder discussions found that many residents are unfamiliar with or hesitant to use services such as telehealth appointments, as noted by Anna Yankelev, strategic planning and partnerships manager for the Lake County Health Department.

Completing an assessment to create a scope and design of a community connection center will continue to bring stakeholders together to examine barriers and solutions. If initial work suggests strong demand from the community, strong interest from committed partners, and a pathway to funding and implementation, then there is high likelihood that this community center will succeed and help the community. Conceptually, the center could offer skills training, incubators for data-focused small businesses, private rooms for telehealth appointments, and afterschool programs, to name some of the many opportunities. Even the process of planning, funding, and building the facility will serve as a catalyst for partnerships, unique events, and business opportunities and will help spotlight urban digital inequities and solutions.

There is the potential for funding such a facility. The State of Illinois will administer its $254 million Capital Projects Fund allocation through its broadband office; the state will have until September 24, 2022, to submit a formal grant plan describing how the state's allocation will be used.[6] In light of the potential of this type of facility to not only expand access to high-speed internet services, but also to help the community recover from economic losses experienced by the pandemic, we recommend that ConnectWaukegan and committed stakeholders engage with state agencies to understand the opportunity to fund this type of facility through other sources of federal funding. In addition, the $2.75 billion of the Digital Equity Act of 2021 may also provide an opportunity for public funding; the state will get an allocation to do a statewide plan; if the NTIA approves the plan, Illinois will get funding over five years.

Corporate partners and generous community and family foundations in Lake County already provide needed support for critical initiatives in Waukegan. This robust history of support is unique and could help move the concept through research, design and early implementation. ConnectWaukegan might also consider approaching the Illinois Broadband Office to provide funding to a nonprofit that trains people to become part of a corps of tech-savvy community outreach specialists to help older residents or others in need to learn basic digital skills.

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[6] Frequently Asked Questions, Capital Projects Fund. Dept. of the Treasury. Coronavirus Capital Projects Fund FAQs (treasury.gov) (accessed December 4, 2021).

If validated by input from the community, the connection center concept may also potentially include the exploration of a workforce training and recruitment program. Some pandemic relief Treasury funds may be applicable here. The funds are administered through the Illinois Association of Community Action Agencies (IACAA) and cover emergency needs of job seekers seeking to meet an employment goal. The pilot began in fiscal year 2021 and has been approved to continue in fiscal year 2022. ConnectWaukegan shared that it has advocated with the Governor's office and state legislators to allocate ARPA funds to a new barrier reduction fund administered by the Illinois Department of Commerce and Economic Development; this fund is part of the Job Training and Economic Development Grant program (JTED).[7]

To clarify the exact scope of the digital community center we recommend the following steps:

- Convene community partners to begin a scope and design project. This may include local workforce development resources, College of Lake County, libraries, school representatives, the Lake County Health Department—and assess community interest. Research should include focus groups with residents and agencies to assess both interest, priority services, and potential locations

- Engage public, corporate, and nonprofit partners to explore potential funding opportunities and understand the appetite for ongoing support

- Research other available alternative centers around the country to understand the most effective and impactful models of support

- Explore job training and workforce development as they may provide potential program adjacencies. Since 2012, the department of Labor and The Wireless Industry Association, along with members and other commercial partners, have administered a Telecommunications Industry Registered Apprenticeship Program.[8] In Illinois, there is the Broadband Telecom two-year degree and certification program at Lincoln Trail College in Eastern Illinois.[9] This may provide a model for CLC or other post-secondary programs in the community to create similar programs.

Going through the above steps will help determine the viability of the concept. If there is strong interest, the next step is to identify a site or sites of a size suitable to meet the needs identified through that process and a cost estimate for necessary staffing, computers, and bandwidth, and other overhead to meet the programmatic needs identified by the partners. Backing out the

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[7] https://www.illinoisworknet.com/WIOA/Resources/Documents/JTED%20BIDDERS%20CONFERENCE%20PPT%20Final.pdf
[8] https://www.tirap.org/; https://www.apprenticeship.gov/apprenticeship-industries/telecommunications
[9] https://www.iecc.edu/telecom/

financial and staffing commitments made by the partners will yield an estimate of the remaining budgetary gap requiring funding.

In terms of devices, the existing Comp-U-Dopt program sponsored by the United Way in Waukegan; and Pcs4People, which also has established a presence in Illinois; are natural potential partners. In addition, the device credit portion of the ACP also provides potential device solutions, though the subsidy is one time and must be provided by a wired or wireless provider using the $30 subsidized service.[10] Comcast presents a challenge as it appears not to allow the application of the device credit for the new Dell laptops or Chromebooks that they offer for $149.99 to Internet Essentials Customers.[11]

In any event, such programs will only be as valuable as the quality and utility of the devices being distributed. The programs should also provide some type of ongoing support or exchange program for these devices.

This type of device program would have a greater impact if paired with digital skills training. The Community Connection Center could provide such training, or it could contract with other organizations including affordable housing and education institutions. The College of Lake County already provides computer skills classes and this program could be a referral source for this and other appropriate skills training opportunities.

Although the scope of this report did not include exploring telecommunications job training programs, we note that there is a well-documented shortage of skilled labor in this industry.[12] Even prior to the global pandemic, telecommunications and broadband companies were experiencing shortages of skilled and non-skilled labor to build and maintain communications networks. [13] This labor shortage has only increased over the last two years. Congress acknowledged the need to dedicate resources to gather data and study the issue and directed the FCC and the Department of Labor to form an interagency taskforce to research these issues. These agencies are also directed to work with states to consider how to address the workforce needs and safety of the telecommunications industry.

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[10] ACP Final Rule at paras. 110-115, 130.
[11] "Low-cost Computer," Comcast. Low Cost Computer (internetessentials.com)
[12] https://www.brookings.edu/research/how-federal-infrastructure-investment-can-put-america-to-work/;
[13] https://www.brookings.edu/blog/the-avenue/2021/01/29/biden-needs-to-create-an-infrastructure-talent-pipeline-not-just-more-jobs/

1.4 Recommendation: If an engaged stakeholder such as the WCUSD #60 or City of Waukegan is willing to engage in a planning process, consider feasibility of a fixed wireless deployment to assist households unable to subscribe

Affordability, lack of devices and digital literacy skills are major barriers to connectivity in Waukegan. However, even if the prior recommendations effectively address these obstacles, there is evidence that some residents still may not be able to subscribe to broadband at home. In the case of student households, this becomes a critical barrier to academic progress. In 2020, WCSUD #60 provided more than 2000 MiFi's to student households who lacked access at that time, at an annual cost of more than $400,000. Other community partners including the Waukegan Public Library, CLC, and Beacon Place did the same, creating a patchwork that did not create equitable support to all students. A broader solution should be explored that allows residents the ability to access open networks when home subscriptions are not possible.

Survey data documented the need. In addition to the points mentioned above:

- Low-income residents rely on daily internet outside of the home, including 32 percent who access at a neighbor or friend's home.

- Of respondents who use the internet at home, most use it for critical needs: 86 percent for medical services, 79 percent to access government information and 47 percent for connecting to work.

- About 20 percent of survey respondents have or are planning to start a home business and 89 percent of those who already have that business say that home internet is extremely important. Home internet is critical for business incubation. Achieving equity may mean providing a new means of connectivity.

As a part of this study, CTC engineers developed three potential fixed-wireless solutions that may help close the connectivity gap. At the most ambitious end, Model 1 provides a citywide coverage available to any user, and would come in at a per-household cost of $4,930 over five years. Model 3, using only school buildings and school fiber, would be $2,745 per student household over five years. (ConnectWaukegan notes that if Waukegan provided an open network to all student households, it would provide coverage for 20 percent of the total population.) We recommend that the WCUSD #60 evaluate these and other options to determine whether this approach would be of value and, if so, proceed to a request for proposals (RFP) process. ConnectWaukegan has reported that it is moving forward in a 'proof of concept' test for CBRS fixed wireless technology to determine the functional viability, and that this test will inform and guide further concept development. Wireless technology continues to evolve, and in the next year or two we expect there will be wireless technology

(CBRS or unlicensed spectrum) that may have about 10 times the performance of the current off-the-shelf systems, greatly improving the economics of this approach.

1.5 Recommendation: Although the ACP is the higher priority, consider exploring partnerships with Comcast and AT&T for Internet Essentials subscriptions and bulk-purchase agreements for fiber in apartment buildings

In terms of enrolling Waukegan residents in broadband services, the clear first priority is to maximize participation in the ACP. With that said, closing the documented connectivity gap through bulk purchasing programs—even though they cannot be combined with the ACP—could be an appropriate complement to ACP enrollment if there is an entity willing to put up the funds to pay for service, much as the WCUSD #60 is doing now with hotspots.

Notably, AT&T's bulk-purchase program is the only currently available option that can result in newly built fiber service with symmetrical speeds (same upload speed as download speed). AT&T's bulk-purchase program focuses on large apartment buildings. [14] AT&T's local representatives expressed a willingness to work with property owners to evaluate feasibility and bring its fiber services into larger apartment buildings in the area that would support a bulk-purchase arrangement and lower rates for residents of those buildings. This program creates a purchase agreement between a single payor such as property owner or a third party working with the property owner. The purchase agreement would provide discounts for high-speed data services to end-user households.

Another avenue is Comcast's bulk purchase program, the Internet Essentials Partnership Program or IEPP[15]. ConnectWaukegan or other entity could serve as a sponsor organization and enter into a contract with Comcast to provide discounted service and devices to targeted populations. ConnectWaukegan would use its knowledge and community connections to coordinate eligible customers and distribute the Comcast promotional codes which families would use to sign up for these services without having to navigate enrollment processes.

ConnectWaukegan provided information that in the City of Waukegan there are over 4,000 public housing units with average rent of less than $300, making a residential broadband subscription a luxury for many residents. And barriers like credit checks, auto-pay and contracts add to the challenges. Institutional bulk-buys such as those mentioned above can target those households where need is clearly defined and ensure that reliable, high-speed internet is available to all. Residents would not have to set up or manage accounts or payments.

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[14] https://www.att.com/att/multifamily-property/ (accessed January 27, 2022).

[15] https://corporate.comcast.com/impact/digital-equity/internet-essentials-partnership-program (accessed January 27, 2022).

The question, of course, is who would pay the bulk bill. The ACP has created a funding source for individual households, but this does not allow for bulk purchases. Absent a change in this policy, the City could use ARPA funds. Additionally, ConnectWaukegan provided information that the Chicago Connected and North Chicago Cares voucher programs could become models for how combinations of public and private funders in Lake County could be leveraged. But doing so will require engagement from the Waukegan Housing Authority or other owners of MDUs. Until that happens, the primary focus of ConnectWaukegan and other stakeholder efforts should be to maximize participation in the ACP.

2 The City of Waukegan is served by ubiquitous gigabit cable service from Comcast, with variable service from AT&T; Comcast gaps are found in mobile home developments just outside City limits

Upon launching this study, ConnectWaukegan stated that the City of Waukegan has adequate broadband coverage in some areas, but not all. As a foundational element to all other tasks, CTC worked to develop detailed, reliable data on the actual extent of commercial broadband availability in the City; this is crucial to making any determination on the potential need for new infrastructure.

We determined that the City of Waukegan is served by near-ubiquitous high-speed wired broadband from Comcast. We checked for offers at 72 addresses inside the City and many others surrounding the City boundaries. We found the company offers speeds of up to 1.2 Gigabit per second download, 35 Mbps upload across Waukegan. A company representative stated the company serves 98 percent of premises in the City.

While Comcast in essence fully serves Waukegan, the story is more mixed in some of the low-income neighborhoods just beyond the City limits. CTC went beyond its scope to investigate Comcast service availability in neighborhoods in Gurnee, Beach Park, and Park City. We identified a Comcast service gap in a privately-owned mobile home park known as Genes Evergreen Estates in Park City. A Comcast representative said the company was unable to reach an agreement for service provision at this development. Additional gaps in Comcast service availability are present in a trailer park in Beach Park as shown by Comcast filings to the FCC via Form 477.

Some of these homes may include students at the Waukegan Community Unit School District #60. If there are gaps outside City limits, we recommend that municipal officials in the relevant jurisdictions work with Comcast or other ISPs and private property owners to address the gap, and, if a funding gap explains the lack of connectivity, that officials in these jurisdictions bring the matter to the attention of the Illinois Broadband Office.

Returning to broadband options within the City of Waukegan, while Comcast is near-ubiquitous, the story is far more checkered with AT&T. The company competes in some areas of Waukegan by providing broadband level or better speeds (that is, at least 25 Mbps download, 3 Mbps upload). But in many other areas its DSL service falls short of that threshold or is absent. Indeed, our research—going beyond the number of checks indicated in our statement of work— found that AT&T's offered speeds can vary widely from building to building. Our research showed that some buildings get service far below what AT&T's federal filings describe for the census block in which the buildings are located.

Finally, E-Vergent, a fixed wireless company, states in its federal filings that it is available in the western part of the City, but its website does not allow address-level checks. Taking an extra step,

we worked to engage with the company's leadership in January of 2021 to better understand whether it is a real player in Waukegan. We were able to determine that it is primarily a rural service and may have relay points in Waukegan but that it likely has few subscriptions within the City limits. What's more, our survey process did not result in a single respondent using E-Vergent service. But E-Vergent's president told us the company would be interested in expanding into parts of the City if a business case emerged to solve gaps or reach targeted areas.

2.1   Market assessment methods

CTC's market assessment process involves data collection and analysis of where fiber, cable, DSL, and fixed wireless internet services exist, what service offerings and pricing are available to consumers, and how those relate to demographic patterns. For the purposes of this market assessment, we used FCC Form 477 data, augmented by our research on the retail offerings by ISPs operating in the City. Form 477 data is presented at the census block level, and the FCC considers a census block served by broadband if even one of the premises in the block could be served. Therefore, the data tends to overestimate service availability, as we found with AT&T. Despite these flaws, Form 477 still represents the most comprehensive national dataset for broadband availability.

In addition, CTC conducted this market research by inputting Waukegan addresses into the websites of broadband providers serving the City to obtain data on pricing and service availability. We conducted 72 such checks for Comcast, 40 for AT&T, and 16 checks for E-Vergent, a fixed wireless provider. The pricing we report is, in all cases, the non-promotional pricing; we disregard initial promotional rates. We did not research satellite providers and mobile providers—which do not provide fixed broadband.[16]

This research was conducted in October and November of 2021; prices and plans are subject to change. We randomly selected residential addresses in respective providers' service areas to determine available service and advertised pricing.

2.2   Comcast service territory in Waukegan and neighboring communities

Comcast is the only cable provider in Waukegan and provides nearly ubiquitous coverage across all residential areas of the city. Comcast service also appears to be available in the communities of Gurnee and Park City near the Waukegan border, with exceptions as noted in this report.

Comcast provides a range of data services as summarized in Table 1. CTC found no variation in speeds or pricing at any of the addresses evaluated. CTC updated this table in April of 2022 to reflect the most recent round of price and speed increases, which notably including increases in

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[16] Other providers (such as TDS Metrocom DSL and Cable, and US Cellular fixed wireless were present in Waukegan according to FCC Form 477 data. However, they were not included in this analysis as each provider's footprint was around one census block in size and reflect something other than actual service to the market.)

upload speeds. Comcast regularly changes its promotions, so the offers seen by Waukegan residents and businesses could change.

Table 1: Service Plans Offered by Comcast in Waukegan

Service	Advertised Download/Upload Speeds	Monthly Price (non-promotional)	Notes
Internet Essentials (for low-income customers)	50/10 Mbps	$9.95	No equipment rental fees: no contract required; must meet eligibility requirements
Internet Essentials Plus (for low-income customers)	100/10 Mbps	$29.95	No equipment rental fees: no contract required; must meet eligibility requirements
Connect	50/10 Mbps	$59.00	Optional $10 discount if enabling autopay
Connect More	100/10 Mbps	$79.00	Optional $10 discount if enabling autopay
Fast	300/10 Mbps	$89.00	Optional $10 discount if enabling autopay
Superfast	600/20 Mbps	$99.00	Optional $10 discount if enabling autopay
Ultrafast	900/20 Mbps	$109.00	Optional $10 discount if enabling autopay
Gigabit Extra	1200/35 Mbps	$119.00	Optional $10 discount if enabling autopay, $300 Visa Prepaid Card

2.3 Comcast service is ubiquitously available within the Waukegan city boundaries

Given concerns expressed by some ConnectWaukegan members that high-speed Comcast service may not be universally available in Waukegan, we entered a large number of addresses (72) into the Comcast retail website and found that service was available at all 72 sites, with identical speed and pricing offers. This was consistent with Comcast's statement that it serves 98 percent of premises in the City. Figure 2 shows Comcast's coverage area according to the FCC Form 477 data (red) overlaid with the 72 addresses points within Waukegan that we evaluated for Comcast service (green).

Figure 2: Comcast Service in Waukegan
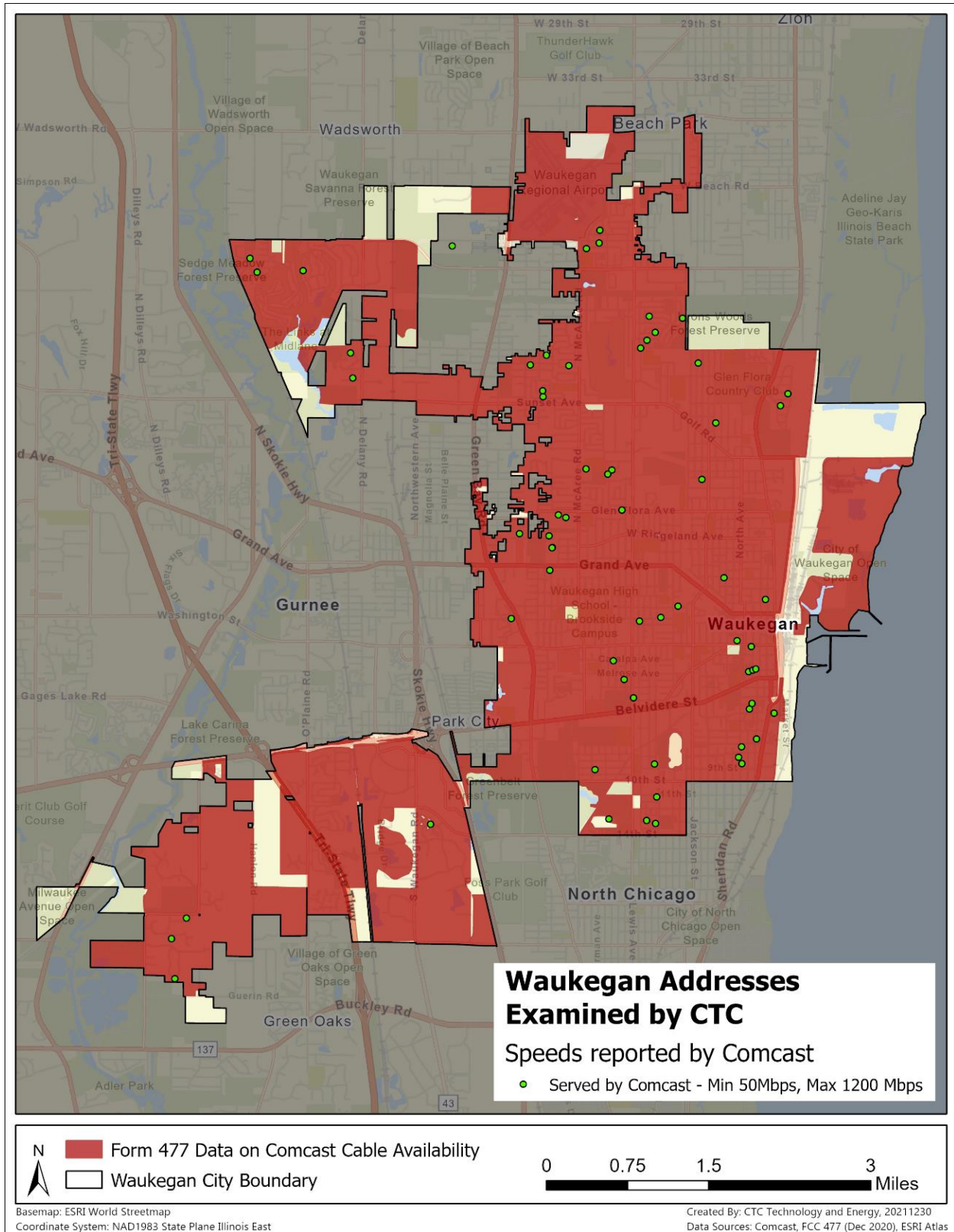
2.4 Comcast service is available in communities bordering Waukegan, but gaps exist in some private mobile home developments

ConnectWaukegan raised concern that Comcast service was not available in some areas outside City limits that fall within the WCUSD. CTC performed additional research beyond Waukegan itself to determine if Comcast service was available in the Park City, Beach Park and Gurnee communities that border Waukegan. CTC found that Comcast service was available in each of these communities with the exception of Genes Evergreen Estates, a privately-owned mobile home park in Park City, and certain areas of Beach Park directly west of the Illinois Beach State Park.

2.4.1 Comcast service is not available in Genes Evergreen Estates in Park City
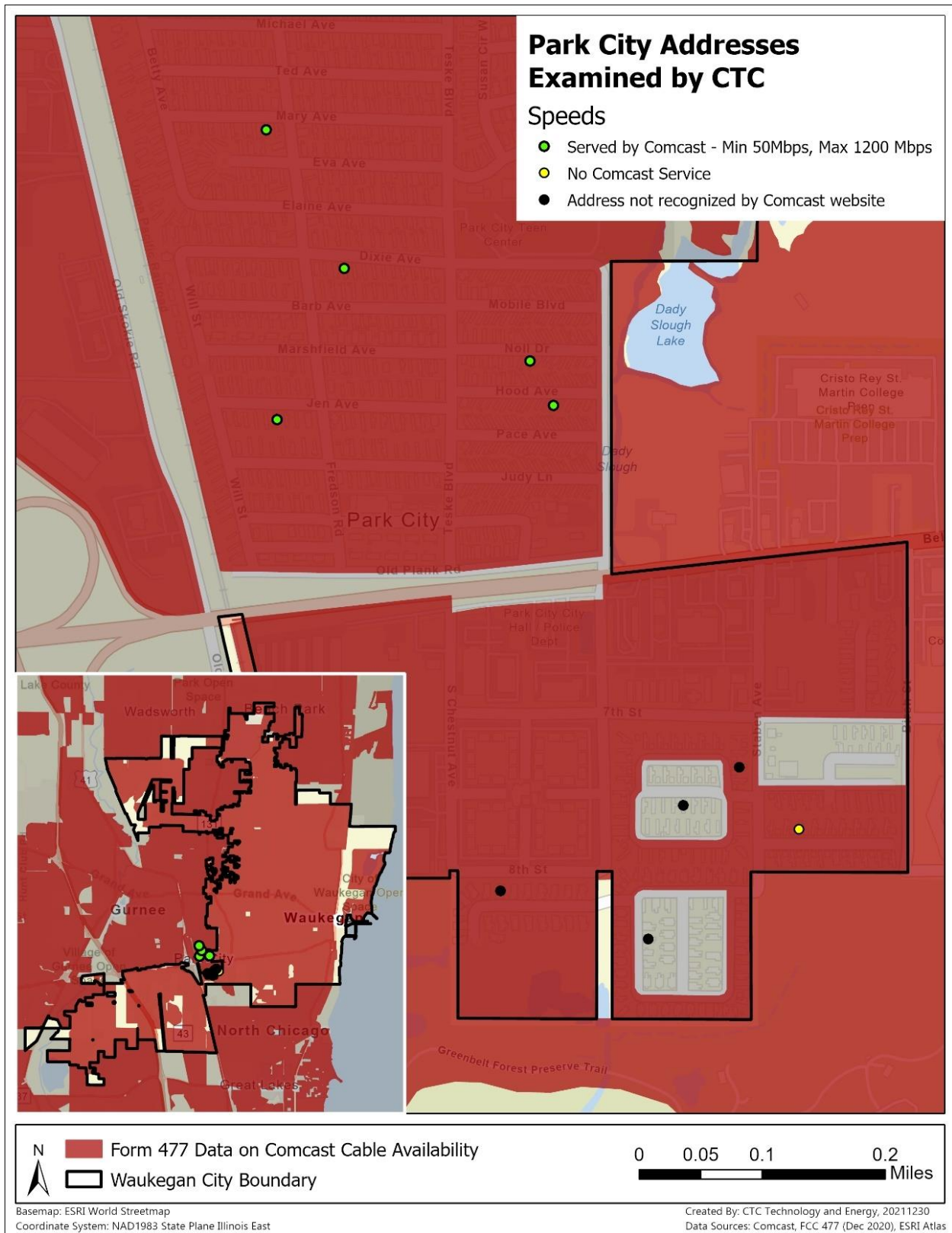
Comcast service was not available to homes within Genes Evergreen Estates, a mobile home park in Park City on the Waukegan border. However, Comcast service is available to mobile homes in Park City Mobile Home Park, located directly across Belvidere Road to the north of Genes Evergreen Estates. Figure 3 shows the addresses in both mobile home parks that CTC evaluated for Comcast service overlaid with Comcast's service footprint according to FCC Form 477 Data. The served addresses in Park City Mobile Home Park are shown in green.

Yellow and black dots within Genes Mobile Home Park reflect addresses that currently cannot receive Comcast service; the yellow dots mark addresses the Comcast website said service was unavailable and the black dots reflect addresses not recognized by the Comcast website.

A Comcast representative later explained that Comcast was unable to reach an agreement with the owner of Genes Mobile Home Park to provide service there.

Figure 3: Comcast Service Is Not Available in Genes Evergreen Estates, Park City

Park City Addresses Examined by CTC

Speeds

- Served by Comcast - Min 50Mbps, Max 1200 Mbps
- No Comcast Service
- Address not recognized by Comcast website

Form 477 Data on Comcast Cable Availability

Waukegan City Boundary

N

0   0.05   0.1   0.2
Miles

Basemap: ESRI World Streetmap
Coordinate System: NAD1983 State Plane Illinois East

Created By: CTC Technology and Energy, 20211230
Data Sources: Comcast, FCC 477 (Dec 2020), ESRI Atlas

2.4.2   Comcast service is available in Gurnee addresses near the Waukegan border

CTC evaluated 20 addresses in Gurnee-part of which is contained within the WCUSD district and found no gaps in Comcast service availability. All Comcast service tiers available in Waukegan were also available at these Gurnee addresses. Figure 4 shows the addresses CTC examined (green) and Comcast's service footprint in Gurnee according to FCC Form 477 data (red).

Figure 4: Comcast Service Is Available in Gurnee
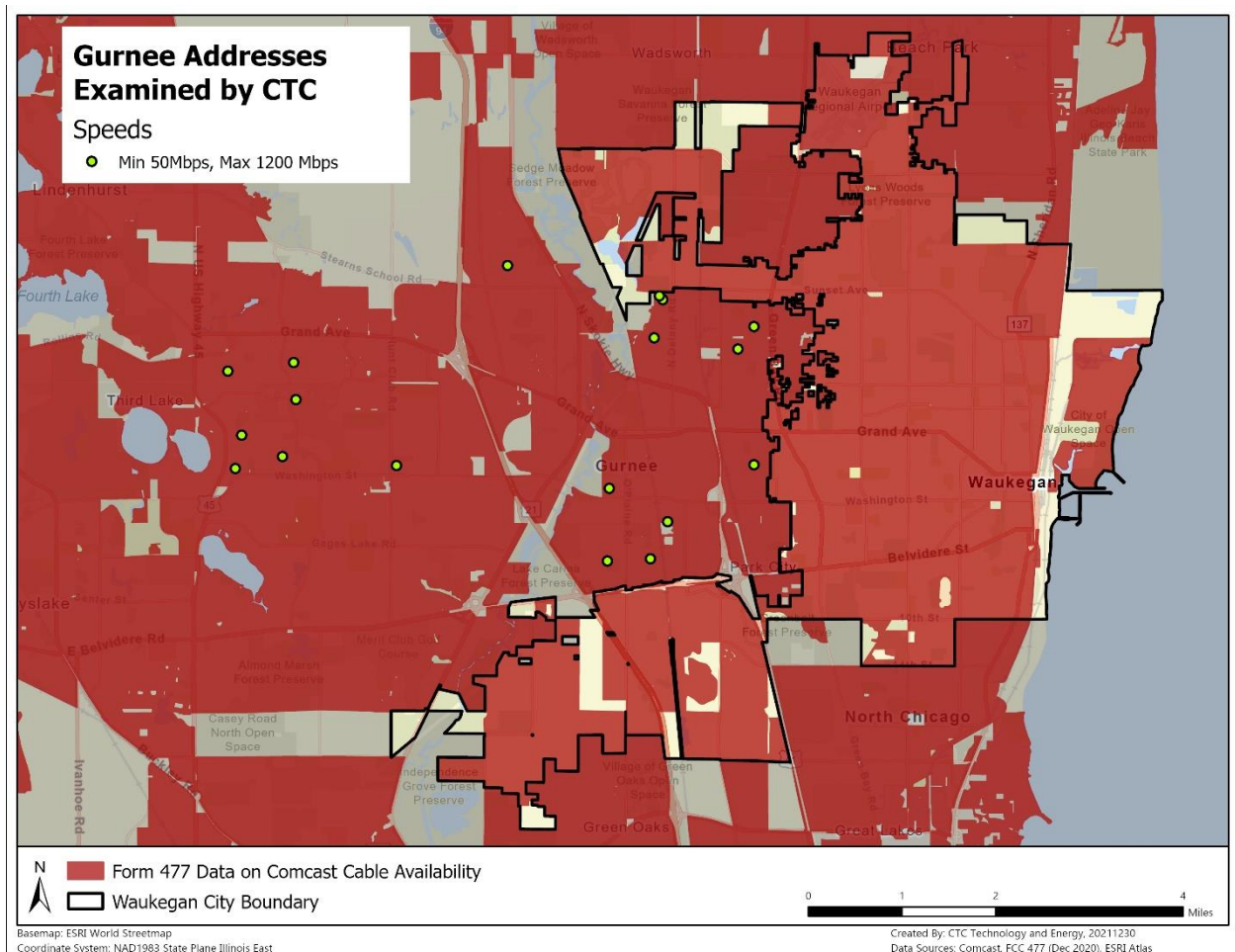
The 20 addresses CTC checked included single-family homes, apartment complexes, and low-income housing tax credit rental properties. CTC found no variation in service availability, speed, or pricing across these housing unit types.

2.5   Comcast service may not be available throughout Beach Park

Beach Park is a village in Lake County, located directly north of Waukegan. We explored Comcast's service footprint in Beach Park at the direction of the Taskforce. According to Comcast's own reports on FCC Form 477, areas of Beach Park near the Waukegan border are not

served by Comcast. Figure 5 shows Comcast's service area as reported on Form 477. Many residential lots are outside of the service area boundary.

**Figure 5: Gaps in Comcast Service Availability in Beach Park**

2.6 AT&T service is highly variable in Waukegan, with many areas only served by sub-broadband DSL service or none at all; federal data is unreliable about available service

AT&T provides internet service in Waukegan largely via Asymmetric Digital Subscriber Line (ADSL), but with pockets of fiber in some areas. Our examination of addresses showed that service is often far below broadband speeds. Figure 6 shows AT&T's service footprint in Waukegan according to FCC Form 477 data and demonstrates the wide variation in maximum speeds available to Waukegan residents from AT&T.

Figure 6: AT&T Service Availability in Waukegan
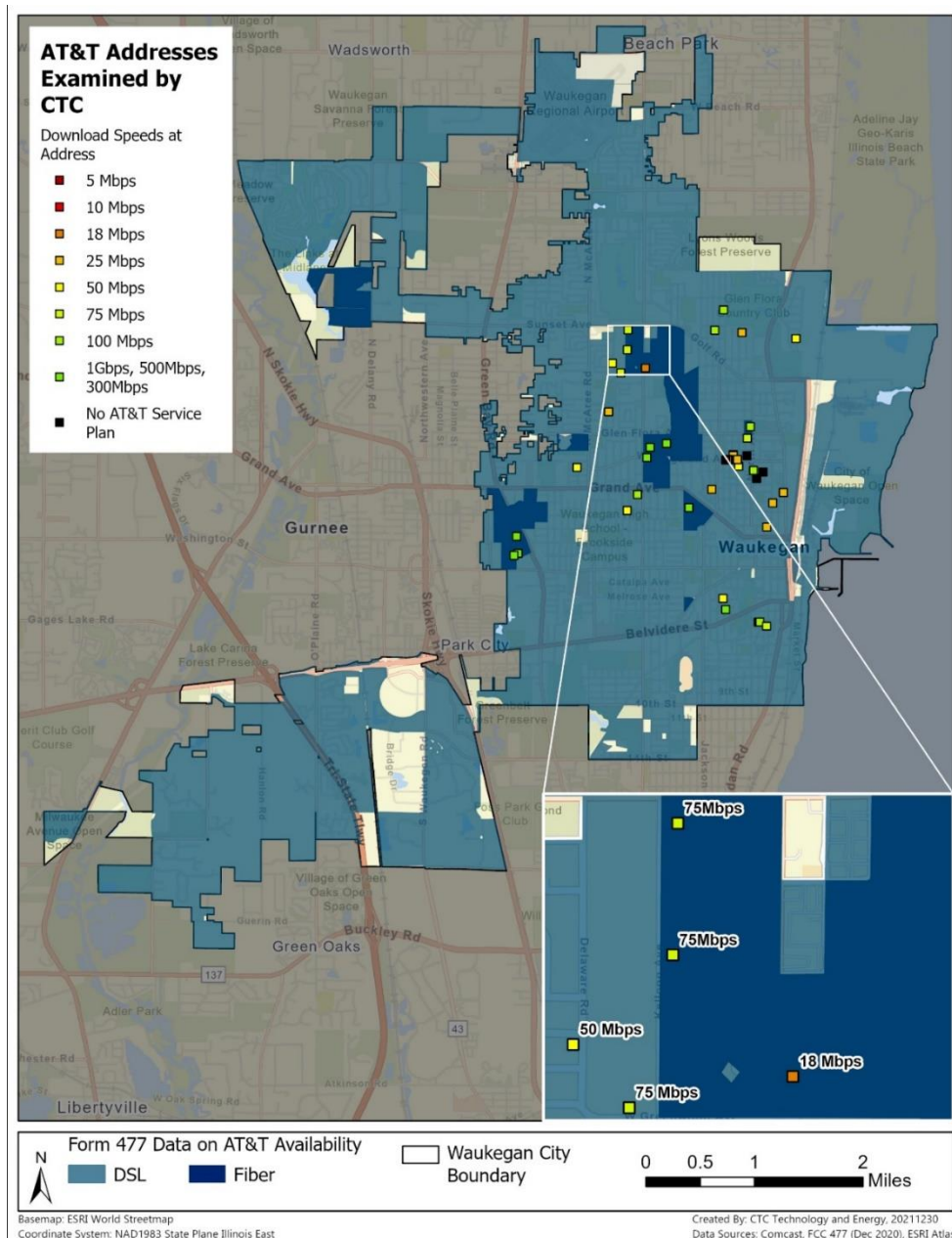
2.7   AT&T service plans available in Waukegan

For the limited number of Waukegan residents for whom AT&T fiber is available, customers may choose three plans offering symmetrical service (that is, the same speed download and upload): a 1 Gbps plan, a 500 Mbps plan, and a 300 Mbps plan. Prices for these plans are shown in Table 2 below.

Table 2: AT&T Plans Available for Locations Able to Receive a Download Speed of 1 Gbps

| Service	Advertised Download/Upload Speeds	Monthly Price (non-promotional)	Notes
AT&T Fiber Internet 300	300/300 Mbps	$40	Does not include $10/month equipment rental, $99 installation costs or a $5/month discount for autopay
AT&T Fiber Internet 500	500/500 Mbps	$50	Does not include $10/month equipment rental, $99 installation costs or a $5/month discount for autopay
AT&T Fiber Internet 1000	1000/1000 Mbps	$65	Does not include $10/month equipment rental, $99 installation costs or a $5/month discount for autopay

However, most Waukegan residents only have DSL service. But from premises to premises, they get vastly different values for their broadband dollar. AT&T charges all DSL customers a base rate of $45 monthly for service. But while some residents are able to get 100 Mbps symmetrical service for this price, others—who pay the same rate—are getting as little as 5 Mbps symmetrical service because AT&T has not upgraded its network in those areas. Table 3 summarizes the various speed tiers AT&T offers, all at the $45 price point.

Table 3: AT&T Plans Available for Locations Receiving Maximum Download Speeds Less than 300 Mbps

Service	Advertised Download/Upload Speeds	Monthly Price (non-promotional)	Notes
Internet Basic 5	5/5 Mbps	$45	Does not include $10/month for equipment rental
AT&T Internet 25	25/25 Mbps	$45	Does not include $99 activation fee or $10/month for equipment rental
AT&T Internet 50	50/50 Mbps	$45	Does not include $99 activation fee or $10/month for equipment rental
AT&T Internet 75	75/75 Mbps	$45	Does not include $99 activation fee or $10/month for equipment rental
AT&T Internet 100	100/100 Mbps	$45	Does not include $99 activation fee or $10/month for equipment rental

Figure 7 shows the different speeds AT&T offers in Waukegan, as reported by AT&T to the FCC.

Figure 7: AT&T Service Variation Across Waukegan
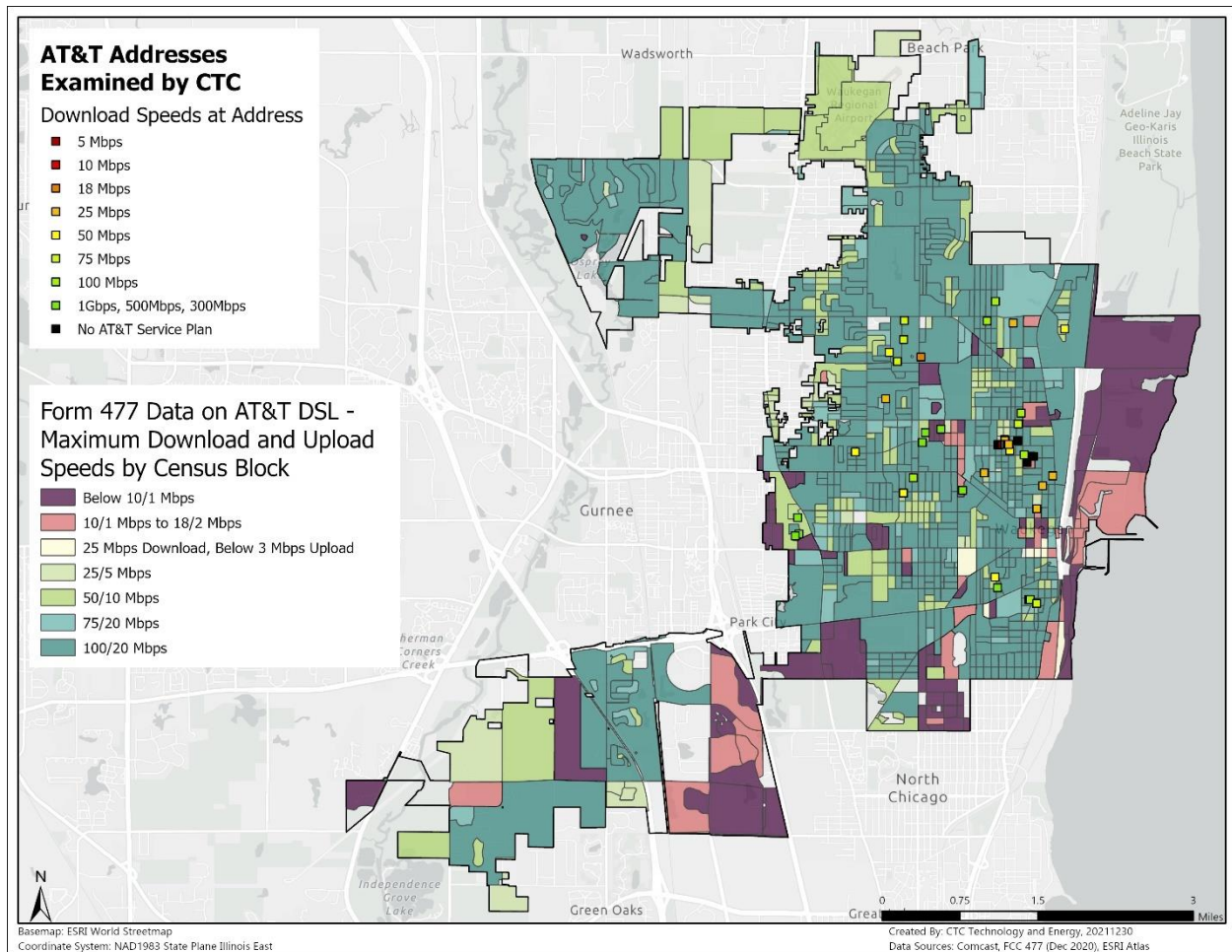
As the figure shows, the citywide picture shows a checkerboard of different service levels by census block. But things get even more complicated within census blocks because individual homes often receive less than the speed reported by AT&T for the block as a whole. For example, Figure 8 demonstrates the range of AT&T service offerings across three census blocks in Waukegan in the area directly southeast of Glen Flora Elementary School.

CTC's review of address-level service offering shows that residences next to each other along West Ridgeland Avenue in Waukegan are not able to get the same speed. FCC Form 477 data suggest AT&T offers speeds of 25/5 Mbps in Census Block 3012 and speeds of 50/10 Mbps in Census block 3011 (both east of the Glen Flora Elementary School). But our research showed that while some homes can get this speed, others can get only 5 Mbps service, and one address we checked had no service available at all.

Form 477 is not a reliable indicator of what AT&T is actually providing to any given home in Waukegan. To the extent ConnectWaukegan or its members may elect to work with AT&T on

providing low-cost services, we recommend that any such program require upfront confirmation that the individual recipient is able to receive at least 25 Mbps service, if not 50 Mbps service or better.

Further detail on the technologies AT&T uses in its Waukegan network can be found in the next subsection.

Figure 8: AT&T Service in Census Blocks 3004, 3012, and 3011
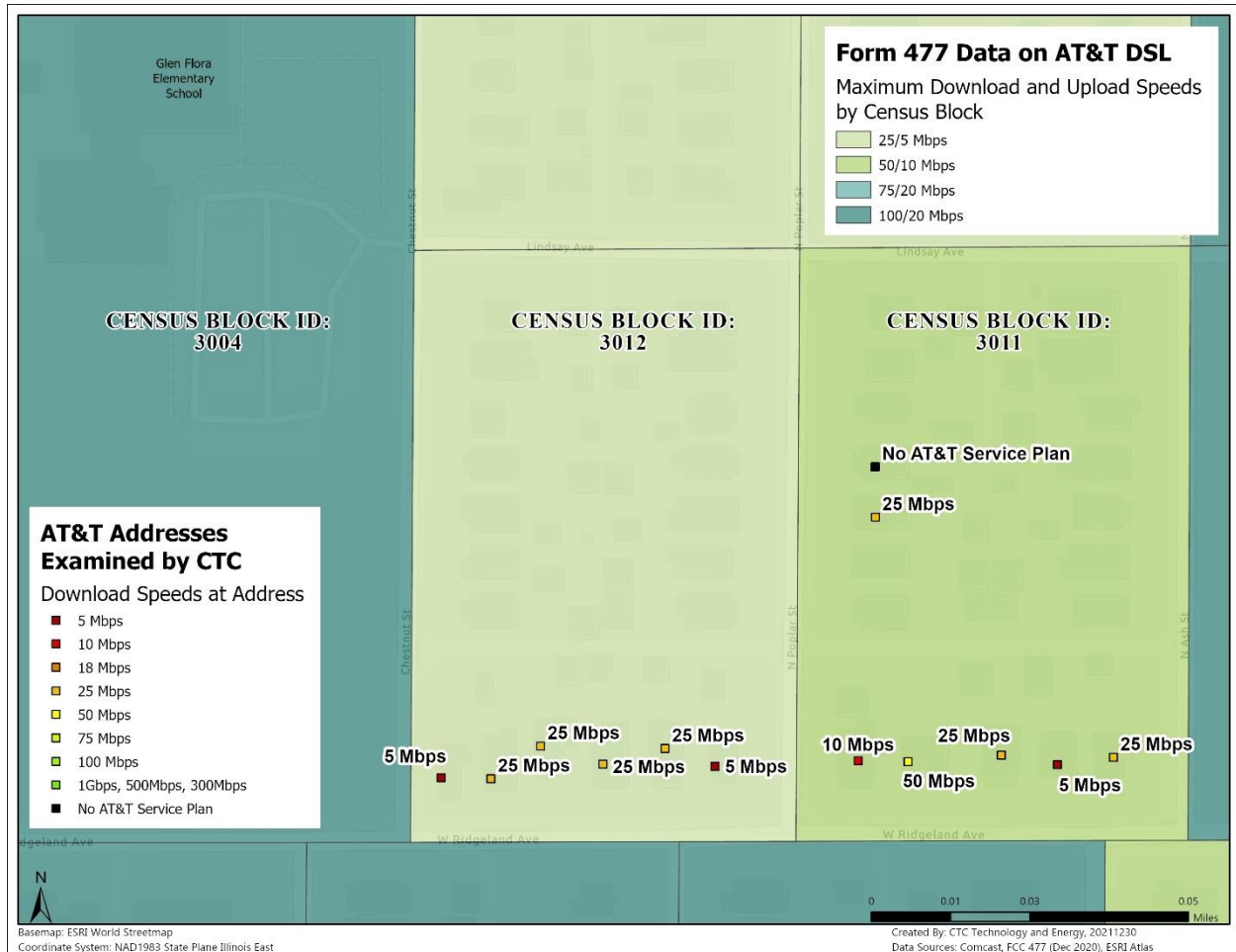
2.8   AT&T's network technology in Waukegan is highly variable

The wide variation in AT&T's internet service speeds offered in Waukegan is a product of the uneven upgrades AT&T has made to the legacy copper wire infrastructure ADSL uses. This variation is typical for Incumbent Local Exchange Carriers (ILECs) such as AT&T. These companies typically upgrade their copper wire network in areas where they expect revenue to be the greatest. This uneven network expansion often mirrors the income levels of neighborhoods and communities: the more affluent areas that have more potential to generate revenue are upgraded first.

This subsection provides further technical elaboration with respect to different versions of DSL technology used by AT&T.

FCC Form 477 uses different codes for technology transmission.[17] Technology types can generally be grouped by codes into their functional categorization. For example, DSL is covered by four[18] technology codes:

10	Asymmetric xDSL
11	ADSL2, ADSL2+
12	VDSL
20	Symmetric xDSL*

*Symmetric xDSL is a set of technologies distinct from Asymmetric xDSL technologies. Symmetric xDSL services are designed to operate only with equal downstream and upstream information transfer rate. They are not typically marketed to residential end users.

Different technology codes often exist within the same census block due to different providers and technologies being available to some, if not all, of the addresses within a census block. In some cases, the same provider may have multiple technologies listed in the same block; for example, AT&T may provide fiber to certain homes within a census block, but also have existing DSL services that can serve the same or other addresses not reached by fiber in a census block.

However, it is also possible to have multiple technologies of the same general *type* existing within the same census block with vastly different reported speeds—i.e., a census block can have Asymmetric xDSL and VDSL listed by the same provider, but one can have significantly higher reported speeds. When grouped together as DSL, the lower reported speeds are obscured and can give the false impression that the higher speeds are all available as DSL.

The cells with bolded text are the maximum download/upload speeds shown on the map in Figure 8 above.

Census Block ID	Tech Code	DSL Technology Name	Maximum Download Speed	Maximum Upload Speed
3004	11	ADSL2, ADSL2+	18 Mbps	2 Mbps
	12	**VDSL**	**100 Mbps**	**20 Mbps**
3012	11	ADSL2, ADSL2+	18 Mbps	2 Mbps
	12	**VDSL**	**50 Mbps**	**10 Mbps**
	10	Asymmetric xDSL	3 Mbps	0 Mbps
3011	11	ADSL2, ADSL2+	18 Mbps	2 Mbps
	12	**VDSL**	**50 Mbps**	**10 Mbps**

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[17] For a full list, see this page: https://www.fcc.gov/general/technology-codes-used-fixed-broadband-deployment-data

[18] Technology code 30 (Other Copper Wireline) is sometimes categorized as DSL as well. Generally, the speeds available for Other Copper Wireline are functionally the same as DSL. Its inclusion is evaluated on a project-by-project basis; in Waukegan, there were no Other Copper Wireline coverage areas in or around the city.

The addresses examined by CTC do not reach speeds anywhere near the maximum reported VDSL speeds and in several cases do not meet the ADSL2 speeds.

2.9 E-Vergent does not presently serve Waukegan but is willing to expand into the City

Federal maps on availability of E-Vergent, a fixed wireless service provider, is highly misleading. Form 477 is well known for overstating service availability because if even one premises within a census block can receive service, the entire block is marked as "served." Our engagement with E-Vergent's president confirmed that the company does not serve Waukegan at present.

Figure 9 shows what Form 477 shows for E-Vergent availability, and we are providing it here only because these maps are in the public domain and provide misleading information. In fact, other than perhaps handful of addresses, the company is not serving Waukegan; it serves rural areas to the west.

With that said, CTC engaged with the president of E-Vergent in January 2021 and he expressed enthusiasm about the potential for partnerships to address broadband or affordability gaps if funds were available and a business case could be made. In some other U.S. cities, small fixed wireless players have played useful roles in addressing broadband gaps and in some cases have used fiber to directly serve targeted buildings. In the infrastructure examples section (Section 7) we noted that in Cambridge Massachusetts, NetBlazr provided competing service to public housing and in San Francisco, Monkeybrains did the same; in both cases, significant public effort and funds were involved in providing building wiring and other forms of facilitation and were carried out through public RFP procurement processes.

Figure 9: Federal Form 477's Misleading Data on E-Vergent Service Availability
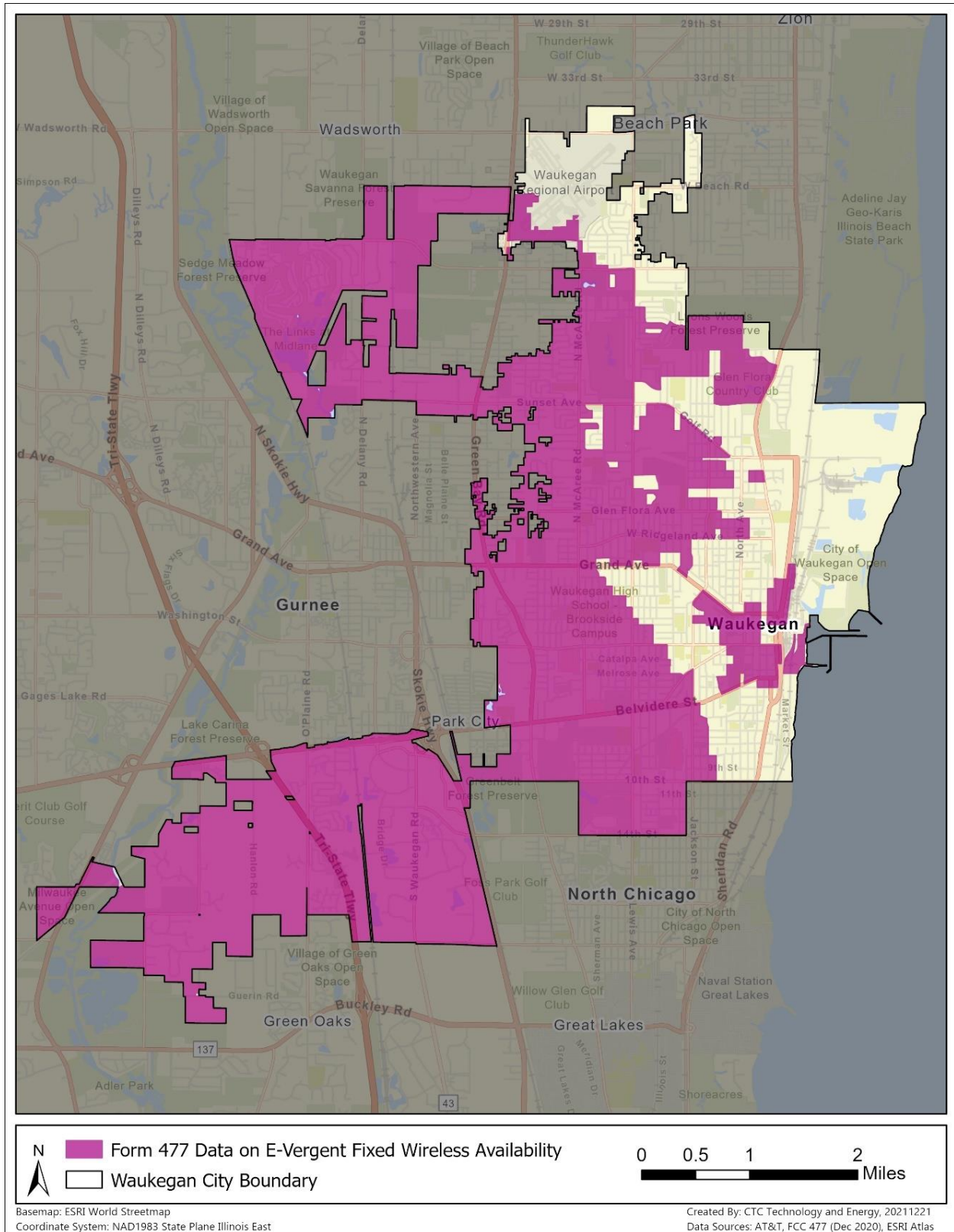
2.10   E-Vergent service plans

E-Vergent offers a total of six different plans, summarized below in Table 4. E-Vergent uses the same pricing for all customers regardless of the speeds the customer is able to receive. Customers pay $64.95 per month whether they receive speeds of 10/2 Mbps or 60/10 Mbps. Again, few Waukegan residents are likely using this service, and the network likely does not reach much of the City.

Table 4: Service Plans Offered by E-Vergent

Service	Advertised Download/Upload Speeds (Mbps)	Monthly Price (Non-Promotional)	Notes
E-Vergent Internet	10/2	$64.95	Does not include $199 installation fee or discount for auto pay
E-Vergent Internet	20/5	$64.95	Does not include $199 installation fee or discount for auto pay
E-Vergent Internet	30/5	$64.95	Does not include $199 installation fee or discount for auto pay
E-Vergent Internet	40/5	$64.95	Does not include $199 installation fee or discount for auto pay
E-Vergent Internet	50/10	$64.95	Does not include $199 installation fee or discount for auto pay
E-Vergent Internet	60/10	$64.95	Does not include $199 installation fee or discount for auto pay

3 Residential mail survey found significant gaps in access, devices, and skills, with the most significant gaps faced by low-income and older populations

As part of its efforts to perform a comprehensive evaluation of broadband gaps, ConnectWaukegan, as part of the larger study, commissioned a mail survey to a random sample of households in Waukegan. This report documents the survey process, discusses methodologies, and presents results. The survey sample was stratified by household income, and the report highlights some key results for the lowest-income cohort (less than $25,000 annual household income).

The survey was intended to gather basic data about the types of services to which residents subscribe and their use of these services (including subsidized programs such as Comcast Internet Essentials) and about their device access and skill levels. The survey was designed to collect data on residents' use of the internet at various locations inside and outside the home and whether internet service is sufficient to meet the needs of households.

The data can serve as a basis for programmatic recommendations today and continue to serve as a resource to ConnectWaukegan stakeholders for years to come.

3.1 Survey process

CTC initially proposed to perform the survey with a sample size of 6,250 households. In response to ConnectWaukegan's concerns over low response rates, CTC boosted the planned sample size to 10,500. Later we also provided 200 paper copies to ConnectWaukegan with the understanding that we would analyze any of these returns separately.

With respect to the mail survey, we mailed 2,500 surveys to households having a household income at or over $50,000 and 8,000 to households having an income of less than $50,000. (These income estimates come from the database used by our subcontractor.) The goal here was simply to increase the chances of gaining more returns from the lower-income segments of the population, by mailing many more surveys to households having lower incomes. (Assessments of statistical validity come from analysis of returns, not analysis of raw numbers of surveys mailed out.)

We provided the survey in both English and Spanish, allowing households where Spanish is the dominant language the choice of responding in Spanish or having an English-speaking household member or other person complete the English version. We incorporated ConnectWaukegan feedback on both the English and Spanish versions. The survey instrument in English and Spanish is provided in Appendix B.

The survey, sent under the "Connect Waukegan" name (referring to ConnectWaukegan's broadband initiative) had a target mailing date of October 29; the survey went out on that date as planned. At meetings in September and October, and at the November 2 meeting in initial days after the mailing, CTC encouraged ConnectWaukegan to promote the survey, particularly to any networks of low-income residents.

Survey recipients were provided with a postage-paid business reply mail envelope in which to return the completed questionnaire by November 22, 2021. Responses were also accepted after the reply-by date. A total of 513 useable questionnaires were received by the date of analysis, providing a gross response rate of 4.9 percent.

We also received 20 of the packets handed out separately by ConnectWaukegan. Because of the very small sample size—and that it cannot be mixed with random returns—this data is provided separately, in spreadsheet form, in Appendix C.

The response rates to the Waukegan survey are provided in Table 5. The breakdown is provided in this way because we mailed far more surveys to households making less than $50,000 than to households making $50,000 or more. The breakdown of responses reflects income as actually reported by the survey respondent.

Table 5: Number of Surveys Mailed and Returned, by Income

Household Income (per income question)	Population	Number Mailed	Targeted Survey %	Number Returned	Percent (of those answering income question)
<$50,000	47%	8000	50%	167	38%
$50,000+	53%	2500	50%	269	62%
No response to income question				77	

Please note that the two rows do not make any statement about statistical validity. The table simply reports raw numbers of returns that came back from the two tranches of surveys mailed out. The next section explains the levels of statistical validity.

3.2   Assessment of statistical validity

A mail survey is far superior to a web survey. A web survey is only available to people who use the internet, the link can be shared unequally or promoted, and it is often unclear who filled out the survey or whether they may have done so multiple times. A mail survey, by contrast, is truly random and can only be responded to by recipients of the random mailing. Even when response

rates are low—which they often are—the data can still be reliable, providing stakeholders with useful data as a foundation for current and future programs and interventions.

The margin of error is a common measure of statistical validity or accuracy. The margin of error for aggregate results at the 95 percent confidence level for 513 responses is ±4.3 percent.

This means that for questions with valid responses from all respondents, we can be 95 percent confident (19 times in 20) that the survey responses lie within ±4.3 percent of the target population as a whole.

The margin of error is larger for various subgroups because of lower returns from lower-income groups.

For the 206 responses received from the Waukegan survey from lower-income households (earning under $50,000 per year as reported on survey returns), the margin of error is approximately ±6.8 percent.

For the 91 responses received from the Waukegan survey from very low-income household (earning under $25,000 per year as reported on survey returns), the margin of error is ±10.3 percent.

3.3   Key findings

Key findings are here presented thematically in three subsections: broadband access gaps, device utilization gaps, and skills gaps in broadband and computer use.

3.3.1 Broadband access gaps

The survey found very few gaps in acquisition of residential internet services, but also that relatively few residents are taking advantage of available subsidized programs. The following are key findings:

- **Most respondents do use the internet, including outside of the home.** Almost all (91 percent) respondents access the internet from any location, including a range of locations outside the home. However, respondents in lower-income households earning under $25,000 per year (84 percent) or $25,000 to $49,999 per year (85 percent) are less likely than those earning $50,000 or more per year (97 percent) to use the internet.

- **Respondents in low-income households are more likely than those in higher-income households to make regular use of the internet outside of their home.** Specifically, many respondents earning under $25,000 per year make weekly or daily use of the internet at a school or college building (48 percent), the home of a family member or friend (42 percent), inside a coffee shop or private business (31 percent), or at a library (19 percent).

- **Comcast dominates the market, with AT&T far behind and having lower satisfaction** Two-thirds of respondents have Comcast internet service, and 22 percent have AT&T wired service. As noted later, AT&T customers expressed somewhat lower satisfaction with speed and reliability than did Comcast customers, which may be a function of the lower service speeds AT&T provides with its DSL service in many areas.

- **Some lower-income households may be underserved.** Most respondents (97 percent) reported having internet service (either home or mobile/cellular connection). However, 8 percent of households earning under $25,000 per year and 7 percent of households earning $25,000 to $49,999 per year report having no internet service. In comparison, all households earning $50,000 or more per year have internet service.

- **Residents may be significantly underutilizing existing broadband subsidy programs.** Just 35 percent of all low-income Comcast customers are enrolled in the ISP's Internet Essentials program for low-income households. Just 4 percent of low-income subscribers receive the $9.25 subsidy under the FCC's Lifeline program, while 51 percent never heard of the program.

3.3.2 Device utilization gaps

Most respondents have access to home internet service and computers, but a sizeable segment may face significant challenges in using, maintaining, and potentially repairing these devices. The following are key findings:

- **Most respondents have access to personal computing devices (desktop, laptop, and tablet) in the home.** This is particularly true among higher-income households earning $50,000 or more per year, where 98 percent have a personal computing device. In comparison, three in 10 households earning under $25,000 per year do not have a personal computing device.

- **More than four in 10 respondents would not be able to quickly replace non-working computers.** Eleven percent of respondents said they could not replace their computer in the foreseeable future if it became unusable, and another 31 percent said it would take one to six months to replace it. Adding these two datapoints, 42 percent of households with home internet service are at risk of not being able to use broadband for very long periods because of computer problems, rather than residential internet connectivity problems.

- **Lower-income households are at greater risk of computer issues**. Three-fourths of low-income subscribers would not be able to replace their computer (25 percent) or would take one to six months to replace it (51 percent) should their computer become unusable.

3.3.3 Skills gaps in using broadband and computers

Most respondents have adequate internet and computer skills. However, a small segment of respondents reported significant challenges with respect to their ability to perform basic functions online and avoid harms. Respondents also expressed some interest in improving those skills. Key findings include:

- **Some respondents may be vulnerable to online harms and disinformation.** When asked if they knew how to recognize and avoid a phishing scam, 17 percent disagreed or strongly disagreed. Sixteen percent disagreed or strongly disagreed that they knew how to recognize false information online and find credible sources of information.

- **Most respondents have the skills to perform basic tasks on the internet.** Overall, most internet subscribers strongly agreed that they know how to use the internet for various functions, including: having and using an email address (85 percent), accessing a website, searching for information online (81 percent), and accessing a bank account online (76 percent). However, respondents in households earning under $50,000 were less likely than those in higher-income households to agree that they are skilled in various uses of the internet.

- **Many respondents are interested in becoming more confident in using computers, smartphones, and the internet.** Specifically, 49 percent of respondents agreed or strongly agreed that they would like to become more confident in using computers and related technology, and 42 percent agreed or strongly agreed they would like to attend training.

- **Many caregivers reported that children under their care have adequate internet skills.** Most respondents agreed or strongly agreed that their children use the internet in positive and beneficial ways (89 percent) and that children are able to complete their homework using available devices and internet connection (80 percent).

- **Caregivers express significant concern about online risks faced by their children, particularly those in higher poverty neighborhoods.** A sizeable segment of caregivers residing in higher poverty neighborhoods disagreed or strongly disagreed their children have skills to detect and avoide false or misleading information online (37 percent), are able to avoid bullying on the internet by their peers (27 percent), and are able to avoid exposure to graphic violence or pornograpy online (35 percent).

3.4 Survey process

In coordination with ConnectWaukegan stakeholders, CTC managed the survey project, including development of the questionnaire, sample selection, mailing and data entry coordination, survey data analysis, and reporting of results. CTC developed the draft survey instrument and provided

it to ConnectWaukegan for review and comment. CTC also facilitated a review of the Spanish translation. ConnectWaukegan provided revisions and approved the final questionnaire.

3.5 Data analysis

The survey responses were entered into SPSS[19] software and the entries were coded and labeled. SPSS databases were formatted, cleaned, and verified prior to the data analysis. The survey data was evaluated using techniques in SPSS including frequency tables, cross-tabulations, and means functions. Statistically significant differences between subgroups of response categories are highlighted and discussed where relevant.

The survey responses were weighted based on the age of the respondent, household income, and ethnicity. The sample was stratified by income level to ensure a sufficient number of responses to analyze data among lower-income households. Also, since older persons are more likely to respond to surveys than younger persons, the age-weighting corrects for the potential bias based on the age of the respondent. In this manner, the results more closely reflect the opinions of the City's adult population.

Figure 10 summarizes the sample and population distributions by age.

Figure 10: Age of Respondents and Adult Population
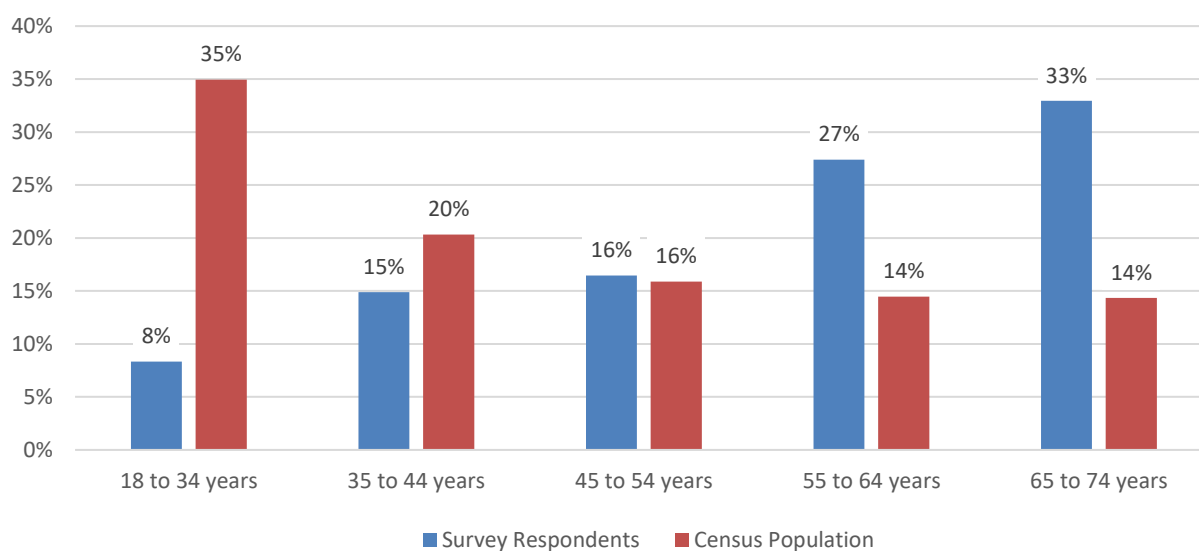
The following sections summarize the survey findings.

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[19] Statistical Package for the Social Sciences (http://www-01.ibm.com/software/analytics/spss/).

3.6   Survey results

The results presented in this report are based on analysis of information provided by 513 residents of Waukegan. Unless otherwise indicated, the percentages reported are based on the "valid" responses from those who provided a definite answer and do not reflect individuals who said "don't know" or otherwise did not supply an answer because the question did not apply to them. Key statistically significant results ($p \leq 0.05$) are noted where appropriate.

3.6.1   Internet connection and use

Respondents were asked about their use of the internet, including home internet connection providers, internet costs and enrollment in programs for low-income subscribers, and devices used. This information provides valuable insight into residents' need for various internet and related communications services.

3.6.1.1 Internet usage

Most (91 percent) respondents make some use of the internet, on any device from any location, as shown in Figure 11. Usage is somewhat lower among respondents with an annual household income below $50,000 but is still relatively high across all demographic groups.

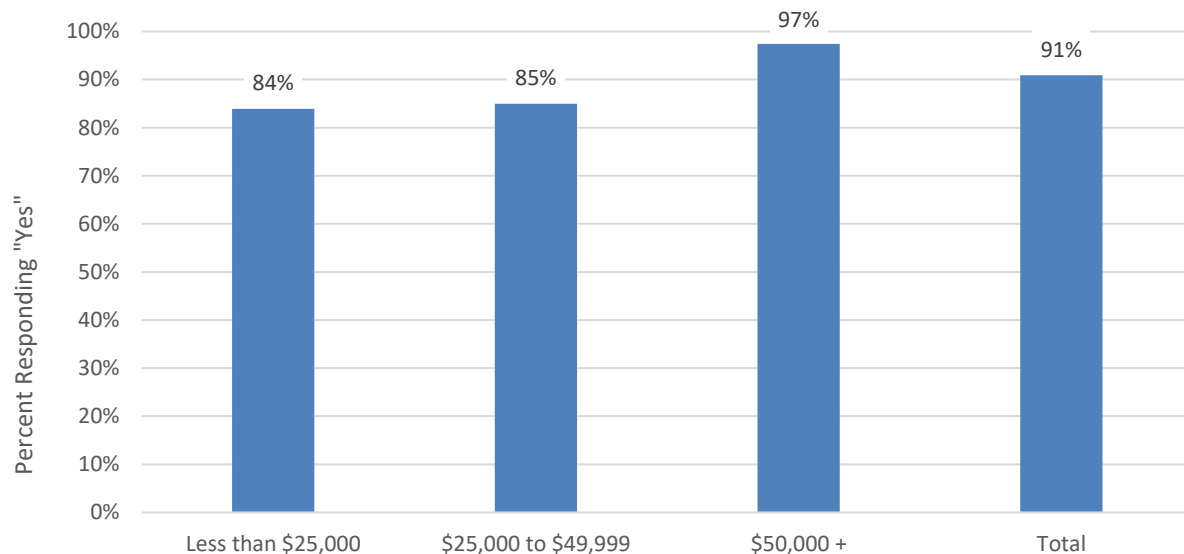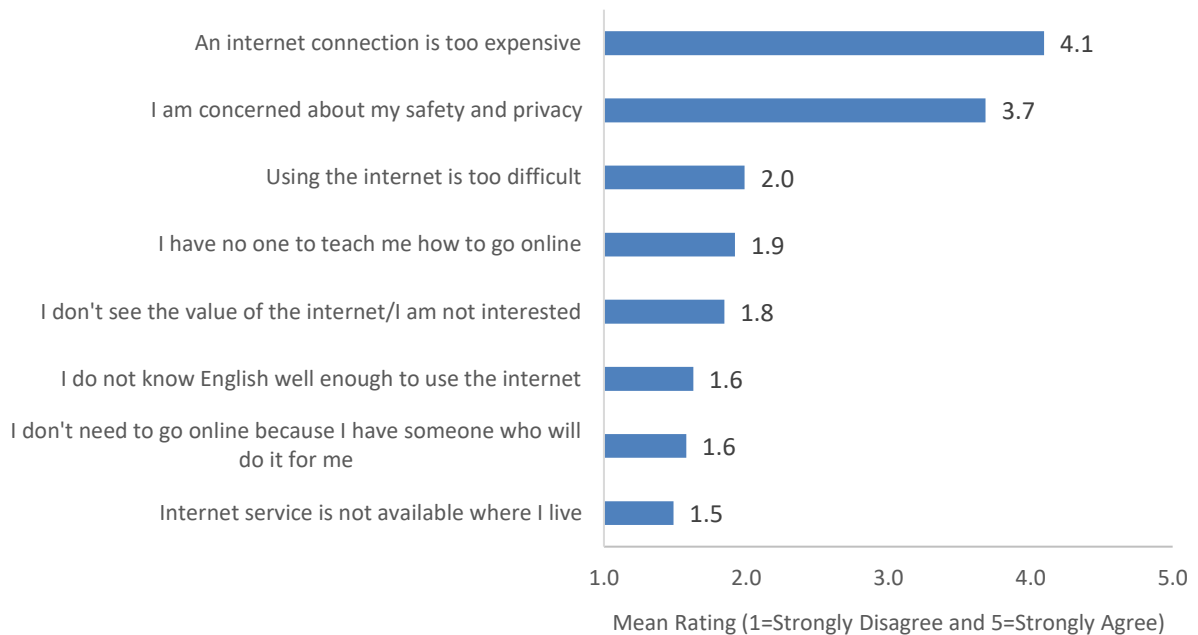**Figure 11: Internet Usage by Household Income**

Table 6 highlights internet usage by various demographic and other variables of interest. In addition to statistically significant differences by household income, those with a high school education or less are less likely than more educated respondents to make use of the internet.

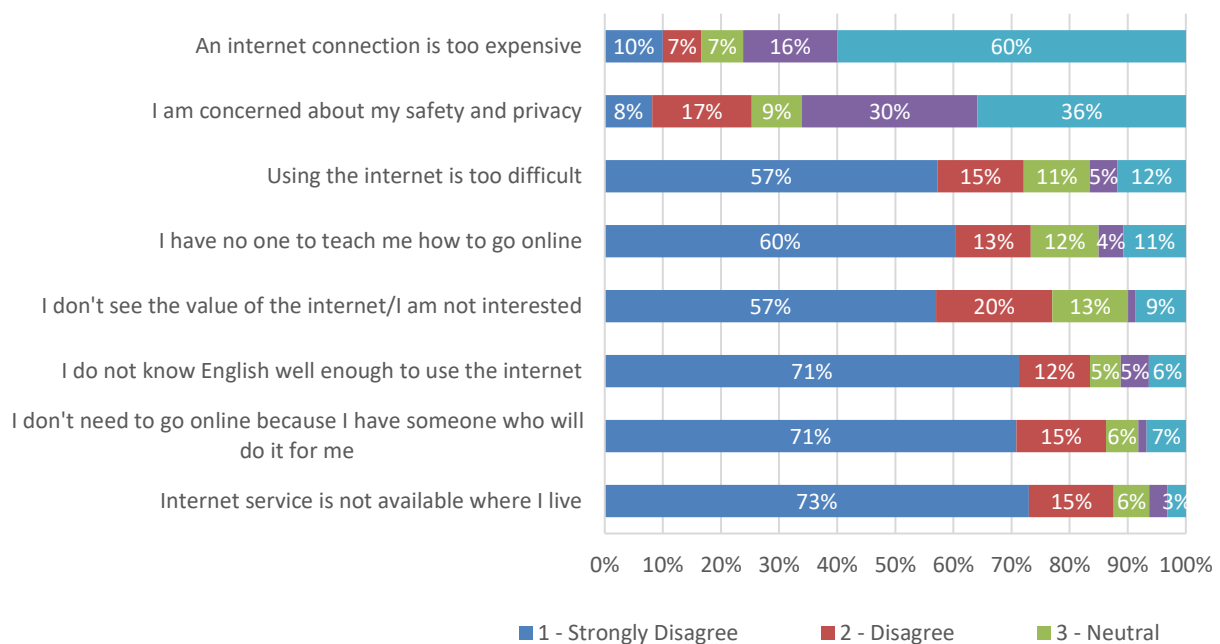**Table 6: Internet Usage by Key Demographics**

	Total Internet Usage	*Weighted Count*
TOTAL	**91%**	*466*
Area of Residence		
Higher poverty census tracts	89%	*211*
Lower poverty census tracts	93%	*247*
Respondent Age		
< 35 years	94%	*149*
35 to 44 years	94%	*86*
45 to 54 years	89%	*71*
55 to 64 years	91%	*75*
65 years and older	86%	*81*
Education		
HS education or less...	84%	*191*
Two-year/technical degree	95%	*95*
Four-year college degree...	94%	*103*
Grad, prof, doctorate	99%	*74*
Income		
Less than $25,000	84%	*80*
$25,000 to $49,999	85%	*106*
$50,000 or more	97%	*214*
Race/Ethnicity		
Black/African American, non-Hispanic...	88%	*45*
Hispanic/Latino	91%	*212*
White/European-American, non-Hispanic	94%	*163*
Other/more than one, non-Hispanic...	85%	*42*
Household Size		
One HH member	86%	*79*
Two HH members	93%	*146*
Three HH members	96%	*79*
Four + HH members	89%	*151*
Children in Household		
No children in HH...	92%	*288*
Children in HH...	90%	*166*
Own/Rent Residence		
Own...	93%	*303*
Rent/live with family/other	87%	*160*

Agreement with reasons for not accessing the internet are highlighted in Figure 12 and Figure 13. The leading barriers to internet access include an internet connection being too expensive (27 out of 45 strongly agree) and safety/privacy concerns (16 out of 45 strongly agree).

Figure 12: Reasons for Not Using the Internet (Mean Ratings)

Reason	Mean Rating
An internet connection is too expensive	4.1
I am concerned about my safety and privacy	3.7
Using the internet is too difficult	2.0
I have no one to teach me how to go online	1.9
I don't see the value of the internet/I am not interested	1.8
I do not know English well enough to use the internet	1.6
I don't need to go online because I have someone who will do it for me	1.6
Internet service is not available where I live	1.5

Mean Rating (1=Strongly Disagree and 5=Strongly Agree)

Figure 13: Reasons for Not Using the Internet

Reason	1 - Strongly Disagree	2 - Disagree	3 - Neutral	4	5
An internet connection is too expensive	10%	7%	7%	16%	60%
I am concerned about my safety and privacy	8%	17%	9%	30%	36%
Using the internet is too difficult	57%	15%	11%	5%	12%
I have no one to teach me how to go online	60%	13%	12%	4%	11%
I don't see the value of the internet/I am not interested	57%	20%	13%		9%
I do not know English well enough to use the internet	71%	12%	5%	5%	6%
I don't need to go online because I have someone who will do it for me	71%	15%	6%		7%
Internet service is not available where I live	73%	15%	6%		3%

■ 1 - Strongly Disagree   ■ 2 - Disagree   ■ 3 - Neutral

3.6.1.2 Devices in the home

Availability of devices is relatively high, with respondents selecting an average of 3.3 types of devices in the home and only 1 percent not selecting any device.

Figure 14: Devices Available in the Home
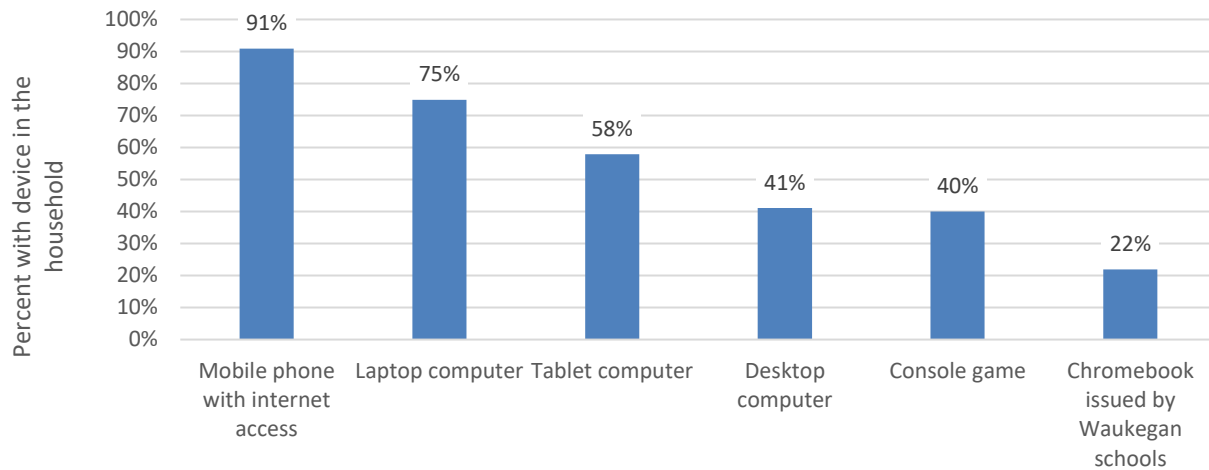
Use of smartphones is highest, with 91 percent of internet users having one, followed by laptops (75 percent) and tablets (58 percent). Forty-one percent of respondents have a desktop computer, and 40 percent have a console gaming device. Another 22 percent of households have a Chromebook issued by Waukegan schools (see Figure 14).

Respondents ages 55 and older are less likely than younger respondents to have a smartphone, console gaming device, or a Chromebook issued by the Waukegan school district, as illustrated in Figure 15.

Figure 15: Devices Available in the Home by Respondent Age
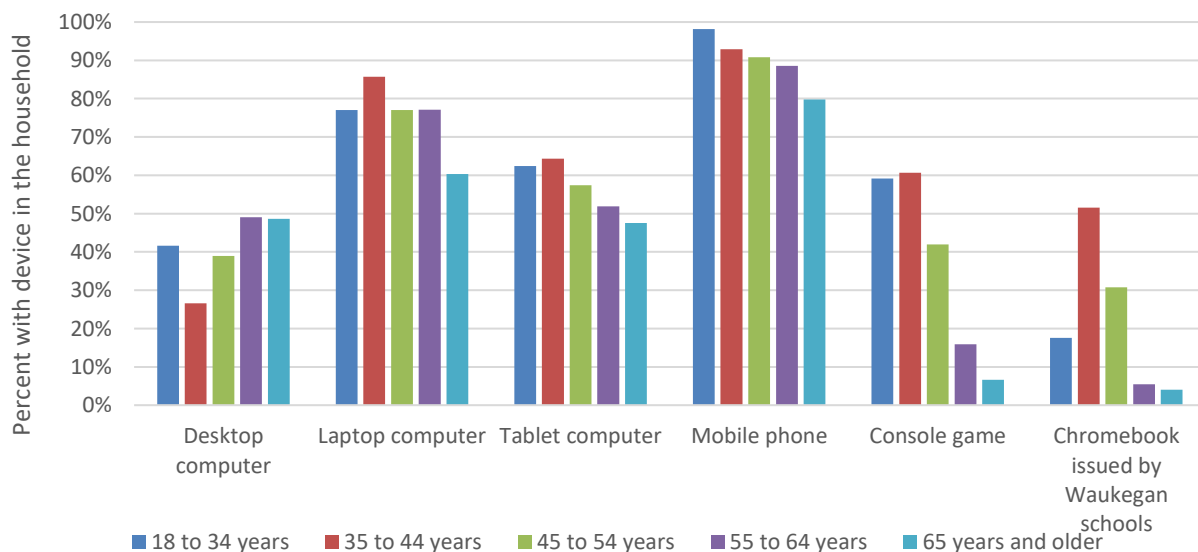
Lower-income households are less likely than higher-income households to have a desktop computer, laptop computer, or tablet computer, and they are more likely to have a Chromebook issued by Waukegan schools (see Figure 16). Specifically, 69 percent of households earning under $25,000 per year have a personal computing device (desktop, laptop, or tablet), compared with 89 percent of those earning $25,000 to $49,999 per year and 98 percent of those earning $50,000 or more per year.

Figure 16: Devices Available in the Home by Household Income
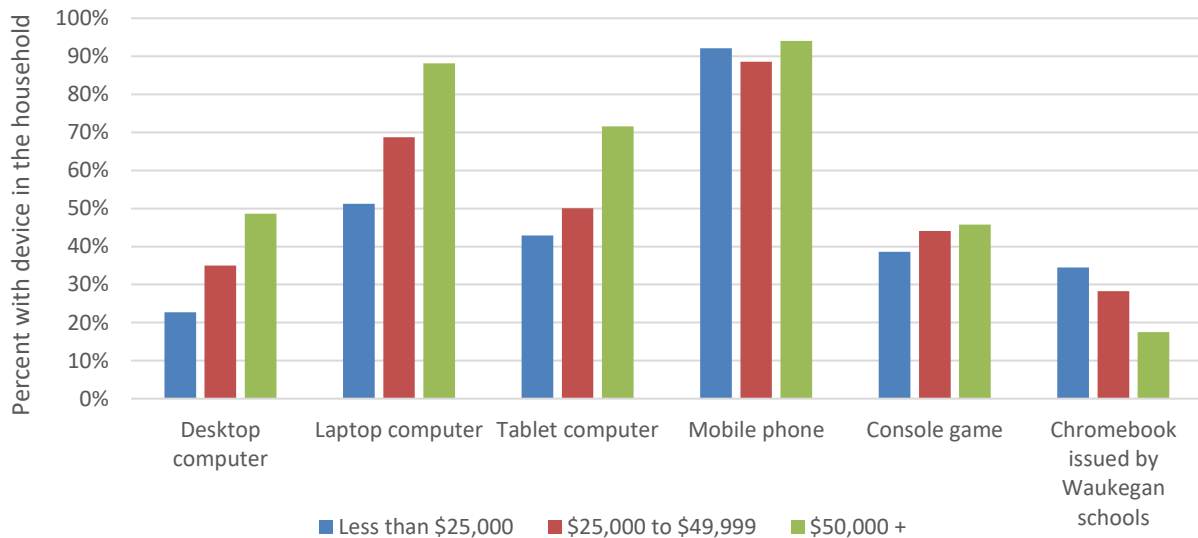
As illustrated in Figure 17, Hispanic/Latino respondents were more likely than others to have a smartphone, console game, or Chromebook issued by Waukegan schools in the home.

Figure 17: Devices Available in the Home by Ethnicity
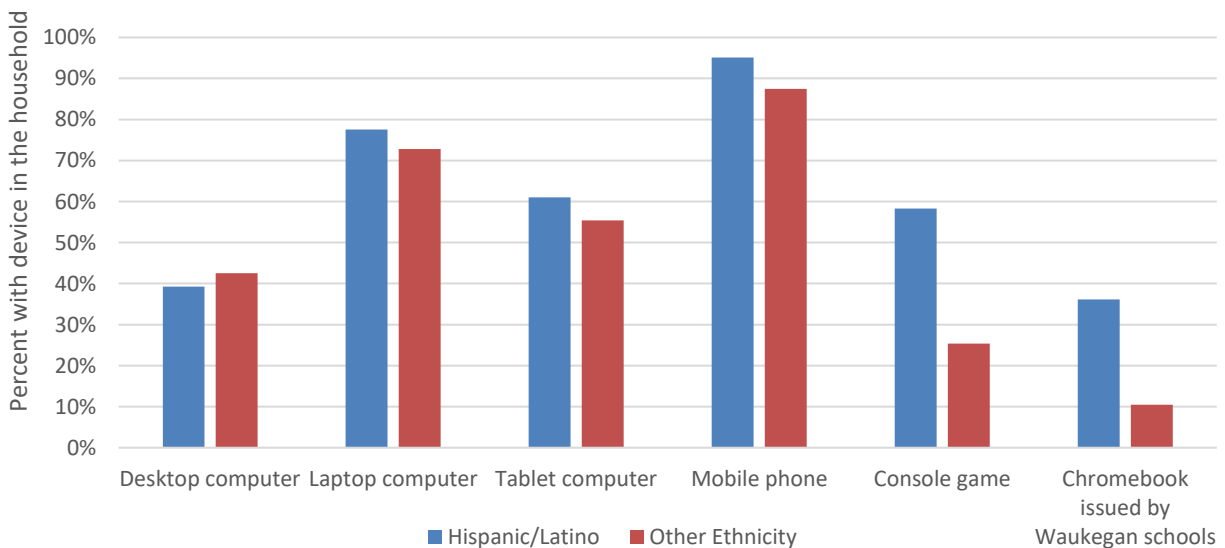
Similarly, households with children were more likely than those without children to have these same devices, as Hispanic/Latino respondents are younger on average and are more likely to have children in the home compared with others (see Figure 18).

Figure 18: Devices Available in the Home by Children in Household
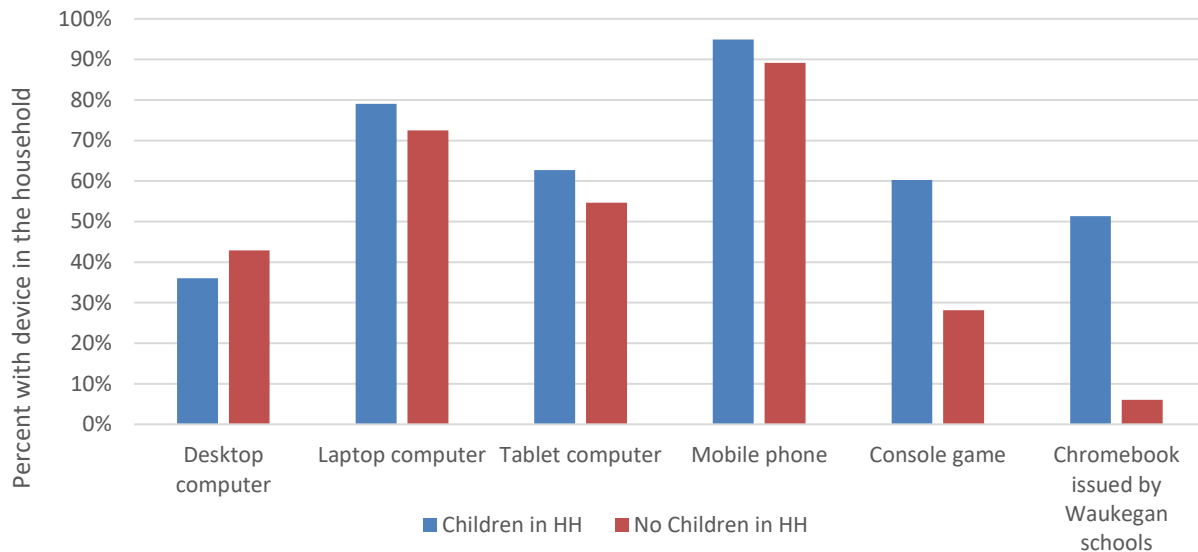
Respondents were asked how long it would take to replace their primary computer if it became lost or damaged beyond repair. Eleven percent of respondents said they could not replace their computer if it became unusable, and another 31 percent said it would take one to six months to replace it (see Figure 19). About four in 10 respondents could replace their computer in one week or less if it were lost or damaged beyond repair.

Figure 19: When Could Replace Computer
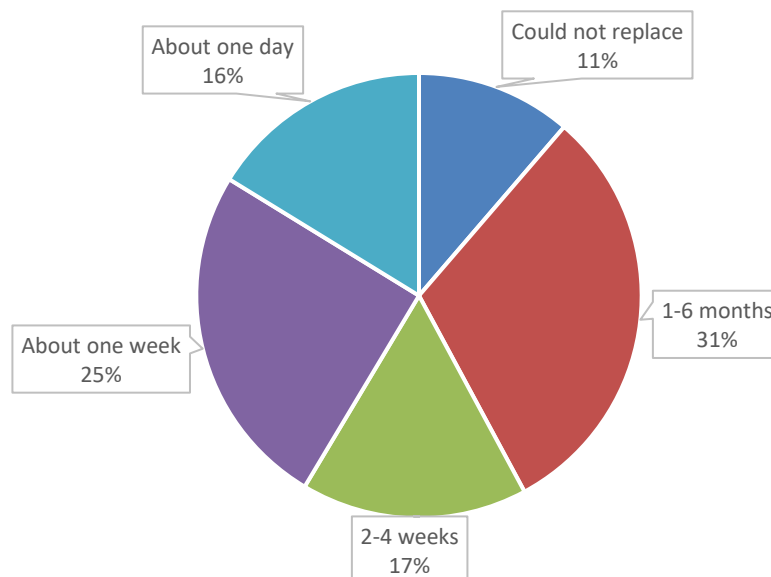
One-fourth of low-income respondents (earning under $25,000 per year) said they would not be able to replace a lost or damaged computer in the foreseeable future, and another 51 percent said it would take one to six months. Just one-fifth said they could repair or replace a computer within a week, compared with more than one-half of respondents earning $50,000 or more per year (see Figure 20).

Figure 20: When Could Replace Computer by Household Income
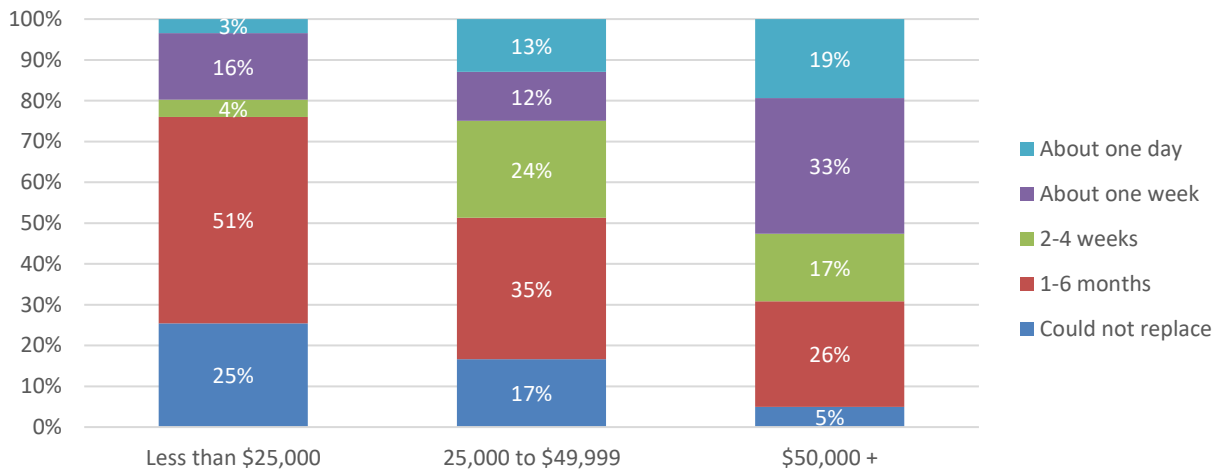
3.6.1.3 Internet service provider

As illustrated in Figure 21, Comcast and AT&T are the leading ISPs overall in the market area. Only 3 percent of respondents do not have internet service.

Figure 21: Primary Internet Service Provider
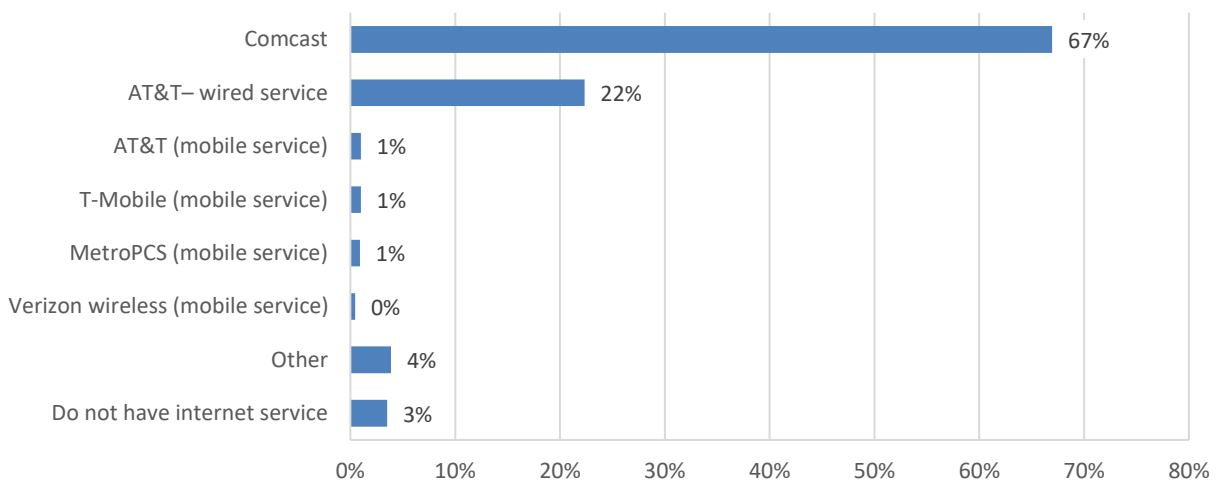
Specifically, two-thirds of respondents have Comcast internet service, and 22 percent have AT&T wired service. Twelve of 17 respondents without internet cited the high cost as the main reason for not purchasing home internet service.

As discussed previously, most respondents have some form of internet access. Total internet access is high across all demographic groups, as shown in Table 7. Respondents in lower-income households are less likely to have internet service, as are those who live alone (who are more likely to be older).

Table 7: Internet Usage by Key Demographics

	No Internet Service	Comcast	AT&T Wired	Other ISP	Total Internet Access	*Weighted Count*
TOTAL	**3%**	**67%**	**22%**	**7%**	**97%**	***503***
Area of Residence						
Higher poverty census tracts	5%	60%	24%	11%	**95%**	*227*
Lower poverty census tracts	2%	72%	21%	4%	**98%**	*266*
Respondent Age						
< 35 years	3%	77%	16%	4%	**97%**	*154*
35 to 44 years	3%	69%	27%	1%	**97%**	*97*
45 to 54 years	3%	64%	24%	9%	**97%**	*76*
55 to 64 years	4%	66%	23%	7%	**96%**	*81*
65 years and older	6%	53%	25%	15%	**94%**	*89*
Education						
HS education or less	5%	63%	24%	8%	**95%**	*210*
Two-year/technical degree	0%	65%	22%	12%	**100%**	*96*
Four-year college degree	5%	69%	22%	4%	**95%**	*116*
Grad, prof, doctorate	1%	76%	20%	4%	**99%**	*78*
Income						
Less than $25,000	8%	69%	14%	9%	**92%**	*90*
$25,000 to $49,999	7%	51%	33%	9%	**93%**	*114*
$50,000 or more	0%	73%	21%	6%	**100%**	*228*
Race/Ethnicity						
Black/African American, non-Hispanic	6%	50%	27%	17%	**94%**	*51*
Hispanic/Latino	3%	71%	22%	4%	**97%**	*227*
White/European-American, non-Hispanic	2%	69%	22%	7%	**98%**	*174*
Other/more than one, non-Hispanic	10%	59%	19%	12%	**90%**	*44*
Household Size						
One HH member	19%	59%	15%	7%	**81%**	*85*
Two HH members	1%	71%	19%	9%	**99%**	*157*
Three HH members	0%	68%	27%	5%	**100%**	*89*
Four + HH members	0%	66%	27%	7%	**100%**	*161*
Children in Household						
No children in HH	6%	69%	18%	8%	**94%**	*315*
Children in HH	0%	63%	31%	6%	**100%**	*177*
Own/Rent Residence						
Own	3%	67%	23%	7%	**97%**	*327*
Rent/live with family/other	4%	67%	21%	8%	**96%**	*173*

3.6.1.4 *Internet service cost and programs for low-income subscribers*

Respondents were asked to give the cost of their home internet service, as shown in Figure 22. The estimated monthly average cost for internet service is $66 overall, $69 for Comcast, and $59 for AT&T wired service. More than seven in 10 respondents pay between $41 and $100 per month for their internet service. Another 13 percent pay more than $100 per month, and 14 percent pay $40 or less per month.

Figure 22: Monthly Price for Internet Service by Provider

Estimated Monthly Avg:
Total: $66
Comcast: $69
AT&T wired: $59

	Comcast	AT&T - wired service	All Internet Providers
More than $120	6%	3%	5%
$101 to $120	7%	3%	6%
$81 to $100	23%	12%	21%
$61 to $80	26%	27%	25%
$41 to $60	23%	35%	26%
$21 to $40	4%	14%	7%
$11 to $20	2%	1%	2%
$0 to 10	8%	6%	8%
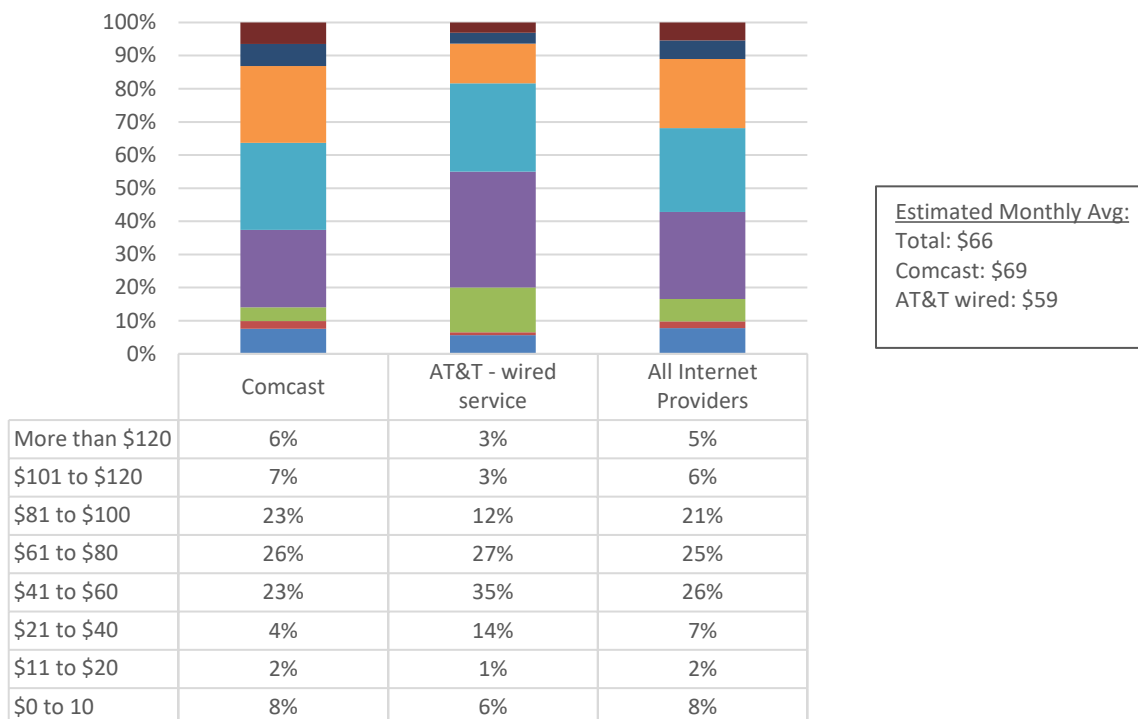
As shown in Figure 23, respondents earning under $25,000 per year pay an estimated monthly average of $49 for internet service, regardless of provider or type of service. This is lower than those with higher income levels.

Figure 23: Monthly Price for Internet Service by Household Income

	Less than $25,000	$25,000 to $49,999	$50,000 +
More than $120	5%	2%	7%
$101 to $120	8%	3%	6%
$81 to $100	11%	20%	25%
$61 to $80	6%	28%	30%
$41 to $60	32%	29%	25%
$21 to $40	6%	9%	5%
$11 to $20	5%	2%	2%
$0 to 10	28%	7%	1%

Estimated Monthly Avg:
Total: $66
<$25k: $49
$25-49k: $62
$50k+: $73
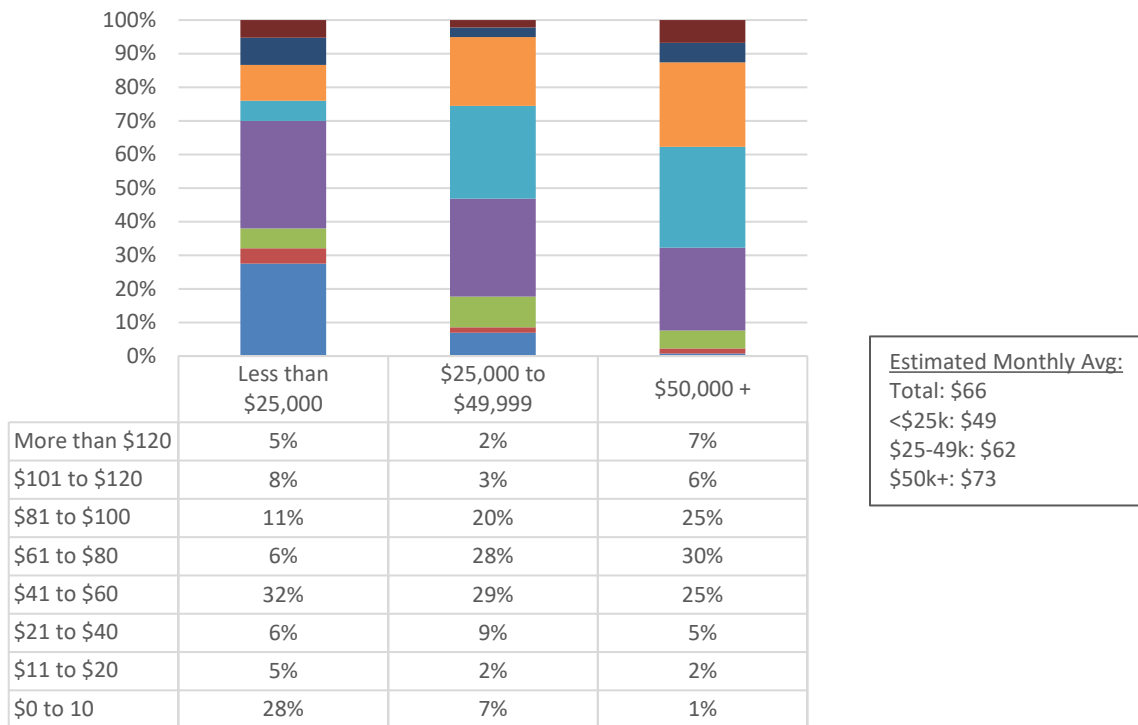
As illustrated in Figure 24, just 10 percent of all Comcast customers are enrolled in the ISP's Internet Essentials program for low-income households. Thirty-five percent of customers earning under $25,000 per year said they are enrolled in the program, while 30 percent said they had not heard about the program.

Figure 24: Enrolled in Comcast Internet Essentials Program by Household Income
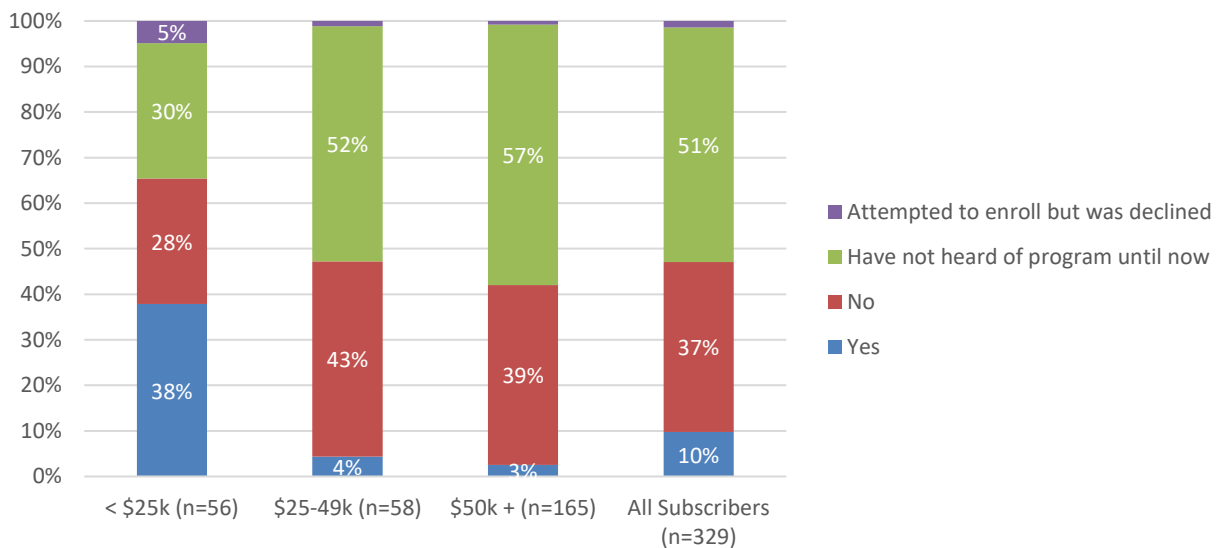
Just 7 percent of all AT&T wired customers are enrolled in the Access from AT&T program for low-income households. More than six in 10 customers earning under $50,000 per year said they had not heard about the program (see Figure 25).

Figure 25: Enrolled in Access from AT&T Program by Household Income
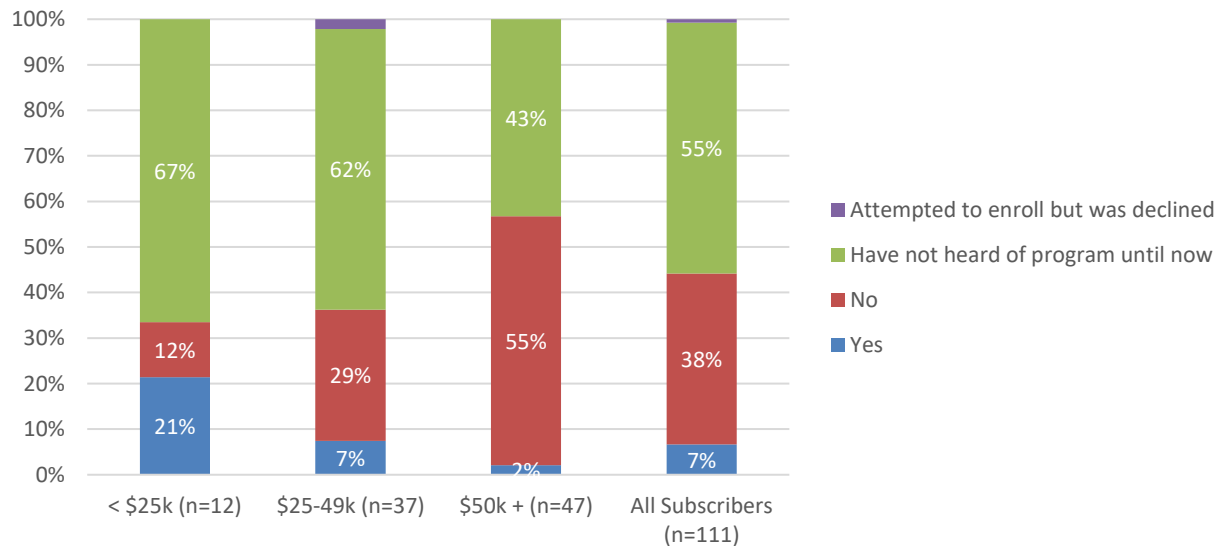
One percent of all internet subscribers, and 4 percent of subscribers earning under $25,000 per year, receive the $9.25 subsidy under the FCC's Lifeline program. Another 46 percent of low-income subscribers said they had not heard of the program. Most households are not receiving the subsidy (see Figure 26).

Figure 26: Receive $9.25 Subsidy Under FCC's Lifeline Program by Household Income
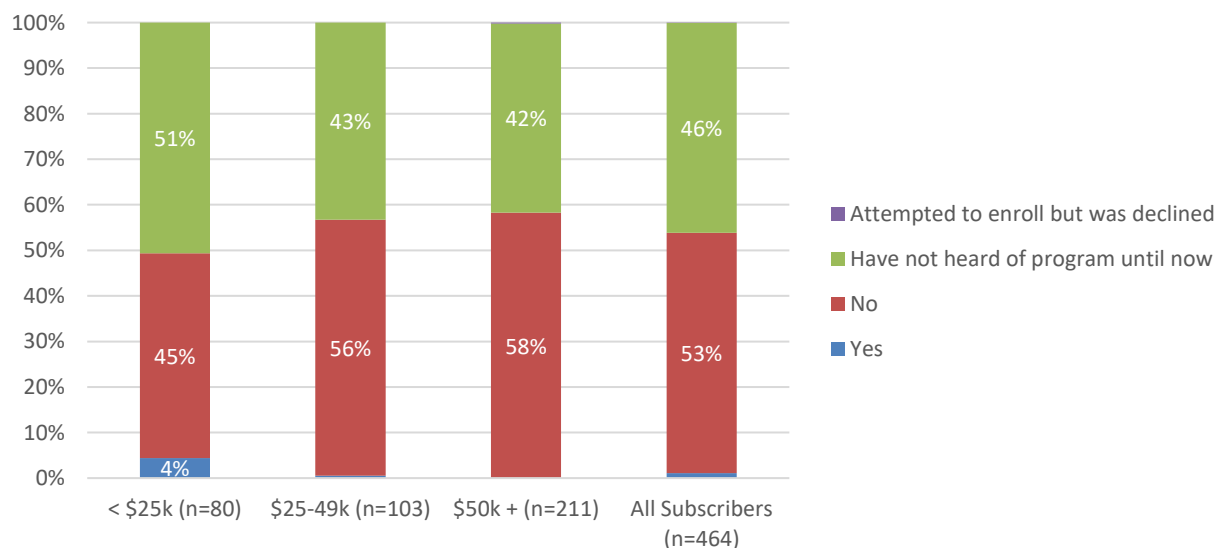
3.6.1.5 Internet uses

Respondents were asked about their use of their home internet connection for various activities. Among those items listed, a home internet connection is most frequently used for social media, banking or paying bills, and watching movies/videos, as shown in Figure 27. A majority of respondents engage in these activities frequently.

Some respondents use a home internet connection to access key information and services. More than eight in 10 subscribers at least occasionally access medical services or government information. More than one-half of subscribers at least occasionally use a home internet connection for attending school/classes or doing homework. Two-thirds of respondents at least occasionally use the internet to connect to work, and 23 percent at least occasionally connect to the internet for running a home-based business.

Figure 27: Home Internet Connection Use for Various Activities
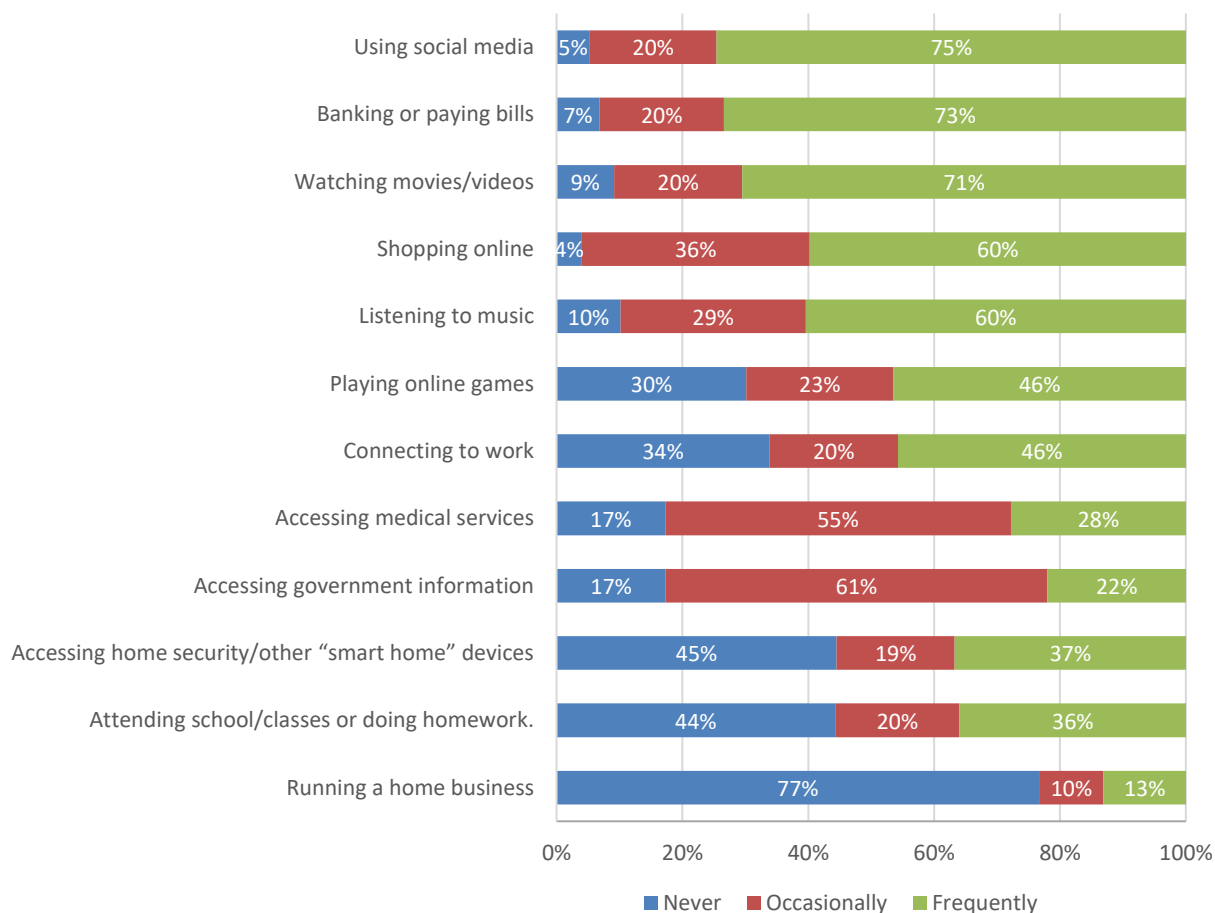
3.6.1.5.1 Internet uses by respondent age

Older subscribers are less likely than younger subscribers to ever use their home internet connection for many key activities, such as connecting to work, running a home business, attending school/class or doing homework, accessing "smart home" devices, listening to music, watching movies/videos, and playing online games (see Table 8). At the same time, many seniors use a home internet connection frequently for various activities, like social media, banking or paying bills, and shopping online (see Table 9).

Table 8: Home Internet Connection Ever Used for Various Activities by Respondent Age

	< 35 years	35-44 years	45-54 years	55-64 years	65+ years
Connecting to work	71%	85%	73%	63%	27%
Using social media	99%	99%	99%	89%	85%
Shopping online	100%	100%	97%	93%	86%
Running a home business	31%	25%	24%	19%	9%
Attending school/classes or doing homework	63%	76%	67%	36%	22%
Accessing government information	86%	80%	82%	85%	80%
Accessing medical services	82%	86%	88%	82%	80%
Banking or paying bills	100%	96%	95%	91%	80%
Accessing home security/other "smart home" devices	70%	54%	56%	46%	38%
Listening to music	97%	97%	91%	89%	67%
Watching movies/videos	100%	97%	94%	83%	71%
Playing online games	86%	74%	73%	55%	45%

Table 9: Home Internet Connection Frequently Used for Various Activities by Respondent Age

Connecting to work	51%	52%	55%	43%	19%
Using social media	88%	76%	74%	68%	55%
Shopping online	67%	69%	54%	55%	44%
Running a home business	21%	10%	14%	10%	5%
Attending school/classes or doing homework	40%	57%	41%	19%	11%
Accessing government information	28%	19%	23%	23%	13%
Accessing medical services	28%	30%	27%	29%	24%
Banking or paying bills	86%	78%	68%	70%	53%
Accessing home security/other "smart home" devices	53%	38%	32%	27%	17%
Listening to music	84%	69%	60%	44%	22%
Watching movies/videos	94%	86%	66%	52%	30%
Playing online games	69%	53%	39%	28%	19%

3.6.1.5.2 Internet uses by children in household

As shown in Table 10, households with children are more likely than those without children to ever use a home internet connection for many key activities, particularly attending school/classes or doing homework and playing online games. Most households with children (and that have internet service) ever use a home internet connection to attend school/classes or doing homework (89 percent), and 64 percent frequently use the internet for educational purposes (see Table 11).

Table 10: Home Internet Connection Ever Used for Various Activities by Children in Household

	No Children in HH	Children in HH
Connecting to work	63%	71%
Using social media	92%	99%
Shopping online	95%	98%
Running a home business	19%	27%
Attending school/classes or doing homework	34%	89%
Accessing government information	82%	83%
Accessing medical services	80%	87%
Banking or paying bills	91%	97%
Accessing home security/other "smart home" devices	51%	61%
Listening to music	85%	97%
Watching movies/videos	87%	97%
Playing online games	61%	85%

Table 11: Home Internet Connection Frequently Used for Various Activities by Children in Household

	No Children in HH	Children in HH
Connecting to work	48%	41%
Using social media	71%	79%
Shopping online	57%	63%
Running a home business	10%	15%
Attending school/classes or doing homework	17%	64%
Accessing government information	18%	27%
Accessing medical services	24%	32%
Banking or paying bills	72%	76%
Accessing home security/other "smart home" devices	33%	42%
Listening to music	53%	73%
Watching movies/videos	65%	80%
Playing online games	37%	62%

3.6.1.5.3 Internet uses by household income

As shown in Table 12 and Table 13, those with a household income of $50,000 or higher are more likely than lower-income households to use an internet connection for some key activities, such as connecting to work and accessing "smart home" devices, and they are less likely to use their connection for attending school/classes or doing homework and for playing online games (as higher-income households are less likely to have children in the home).

Table 12: Home Internet Connection Ever Used for Various Activities by Income

	Less than $25,000	$25,000-$49,999	$50,000 +
Connecting to work	47%	53%	82%
Using social media	94%	95%	97%
Shopping online	94%	95%	98%
Running a home business	21%	20%	25%
Attending school/classes or doing homework	71%	65%	53%
Accessing government information	79%	83%	85%
Accessing medical services	86%	75%	87%
Banking or paying bills	87%	95%	96%
Accessing home security/other "smart home" devices	29%	55%	68%
Listening to music	95%	93%	90%
Watching movies/videos	91%	92%	93%
Playing online games	80%	79%	67%

Table 13: Home Internet Connection Frequently Used for Various Activities by Income

	Less than $25,000	$25,000-$49,999	$50,000 +
Connecting to work	27%	28%	61%
Using social media	63%	82%	80%
Shopping online	53%	57%	65%
Running a home business	17%	11%	13%
Attending school/classes or doing homework	59%	40%	31%
Accessing government information	35%	21%	22%
Accessing medical services	46%	28%	23%
Banking or paying bills	69%	72%	80%
Accessing home security/other "smart home" devices	23%	38%	45%
Listening to music	56%	67%	66%
Watching movies/videos	61%	76%	80%
Playing online games	61%	41%	51%

3.6.1.6 Number of household members online during peak usage times

Most households with internet service (85 percent) have multiple members online during peak usage times, including 58 percent of households with at least three members online (see Figure 28).

Figure 28: Number of Households Members Online During Peak Usage Times
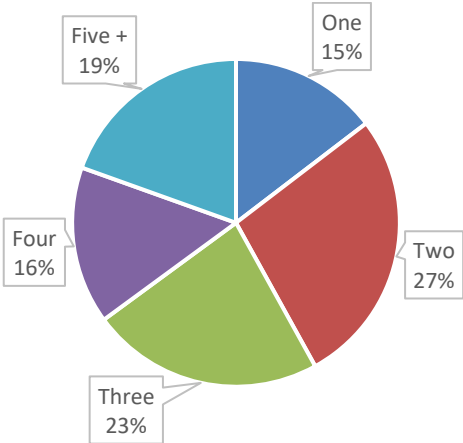
As would be expected, larger households have more members online during peak usage times. Fifty percent of households with four or more members, plus 38 percent of households with children, have five or more members online at the same time.

Low-income households, which are somewhat more likely to have children at home or more household members, reported a higher number of members using the internet at the same time during peak usage times. Three-fourths of households earning under $25,000 per year have three or more members online at the same time (see Figure 29).

Figure 29: Number of Households Members Online During Peak Usage Times by Income
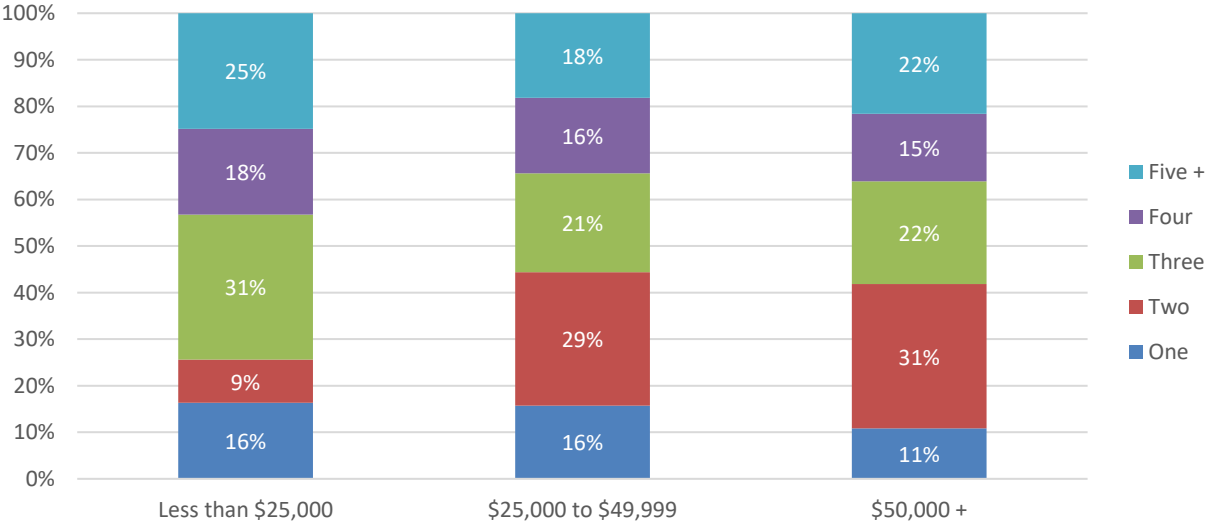
3.6.1.7 Internet service aspects

Home internet subscribers were asked to evaluate their satisfaction with internet service aspects. This was compared with importance ratings given for these same aspects. The importance and satisfaction levels among internet users are compared in the following tables and graphs.

3.6.1.7.1 Importance

Respondents rated connection reliability as the most important internet service aspect, with approximately nine in 10 respondents saying it is extremely important, as shown in Table 14. Nearly three-fourths of respondents rated connection speed and cost as extremely important, and 59 percent rated overall customer service as extremely important.

Table 14: Importance of Internet Service Aspects
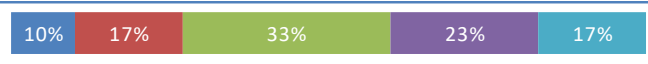
Service Aspect	Mean	Percentages
Speed	4.6	7% · 18% · 73%
Reliability	4.9	9% · 89%
Cost	4.6	10% · 16% · 72%
Customer service	4.3	6% · 18% · 16% · 59%

■ 1 - Not at all important ■ 2 - Slightly important ■ 3 - Moderately important
■ 4 - Very important ■ 5 - Extremely important

3.6.1.7.2 Satisfaction

Overall, respondents are moderately to very satisfied with aspects of their internet service, as shown in Table 15. About two-thirds of respondents are very or extremely satisfied with connection speed and reliability. They are less satisfied with cost compared with other service aspects, which is typical in satisfaction surveys.

Table 15: Satisfaction with Internet Service Aspects

Service Aspect	Mean	Percentages
Speed	3.8	3% · 6% · 25% · 40% · 26%
Reliability	3.8	3% · 6% · 24% · 41% · 26%
Cost	2.8	20% · 23% · 29% · 16% · 11%
Customer service	3.2	10% · 17% · 33% · 23% · 17%

■ 1 - Very dissatisfied ■ 2 - Slightly satisfied ■ 3 - Moderately satisfied
■ 4 - Very satisfied ■ 5 - Extremely satisfied

3.6.1.7.3 Performance

Comparing respondents' stated importance and satisfaction with service aspects allows an evaluation of how well internet service providers are meeting the needs of customers (see Figure 30). Aspects that have higher stated importance than satisfaction can be considered areas in need of improvement. Aspects that have higher satisfaction than importance are areas where the market is meeting or exceeding customers' needs. However, it should be cautioned that the extremely high level of importance placed on some aspects (such as reliability) may make it nearly impossible to attain satisfaction levels equal to importance levels.

Figure 30: Importance of and Satisfaction with Internet Service Aspects
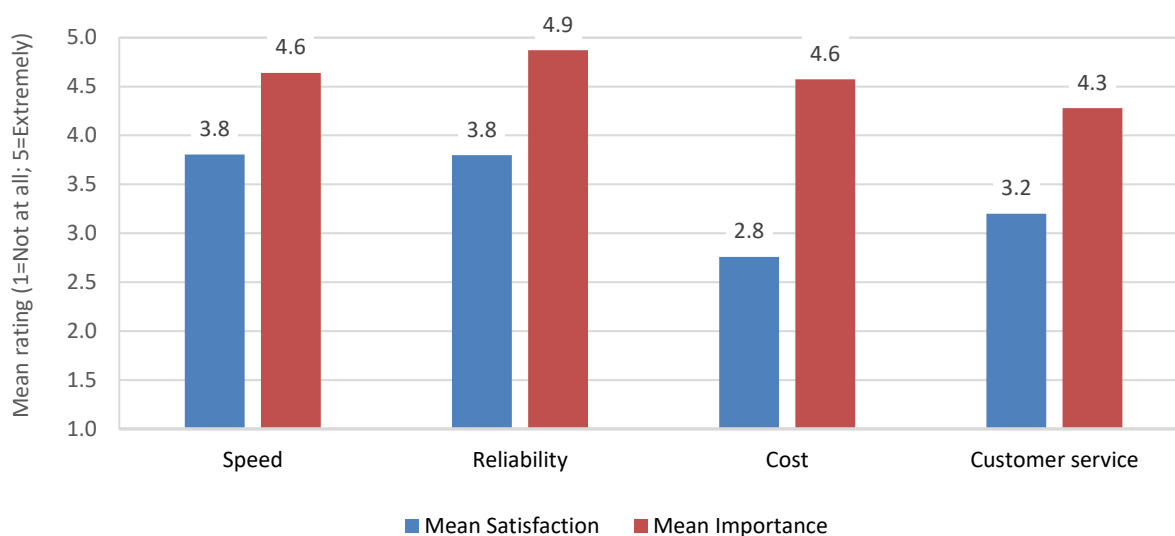
The difference between importance and satisfaction of home internet aspects is also presented in the "gap" analysis table (see Table 16). The largest gap between importance and performance is for cost, followed by customer service and reliability. The lower satisfaction levels could indicate a desire for improved service offerings or a willingness to switch internet service providers if needs are not being met.

Table 16: Internet Service Aspect "Gap" Analysis

	Mean Satisfaction	Mean Importance	GAP < = >	Customer Expectations
Cost	2.8	4.6	-1.8	**Not Met**
Customer service	3.2	4.3	-1.1	**Not Met**
Reliability	3.8	4.9	-1.1	**Not Met**
Speed	3.8	4.6	-0.8	**Not Met**

Specifically, AT&T wired service subscribers placed somewhat more importance on customer service than did Comcast subscribers, and they were also more satisfied with this service aspect (see Figure 31 and Figure 32). Comcast customers were more satisfied with speed, compared with AT&T wired service customers.

Figure 31: Importance of Internet Service Aspects by Connection
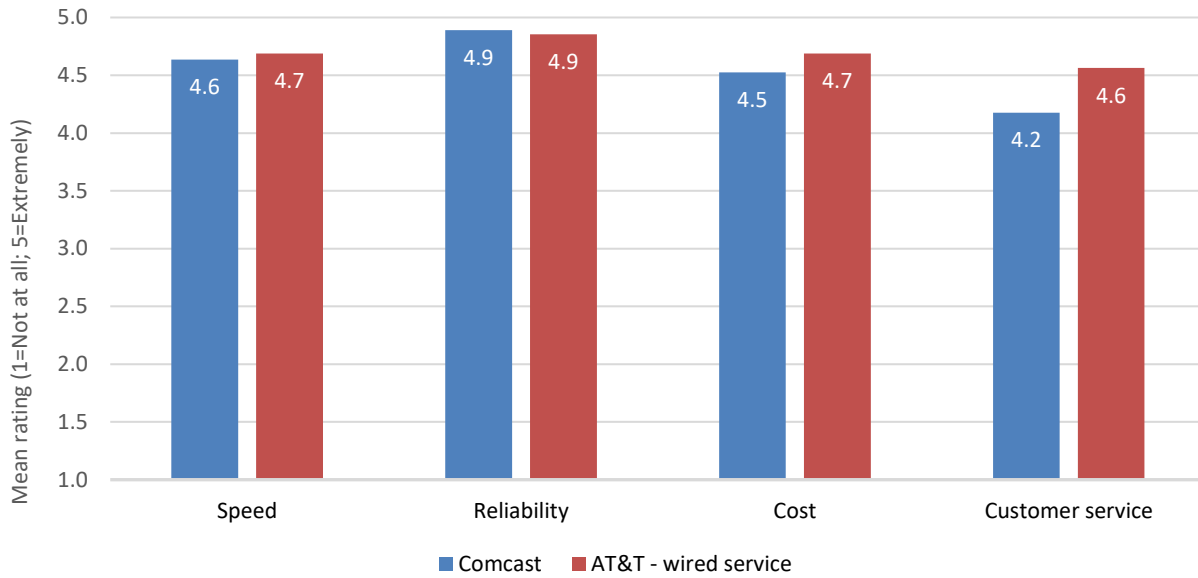
Figure 32: Satisfaction with Internet Service Aspects by Connection
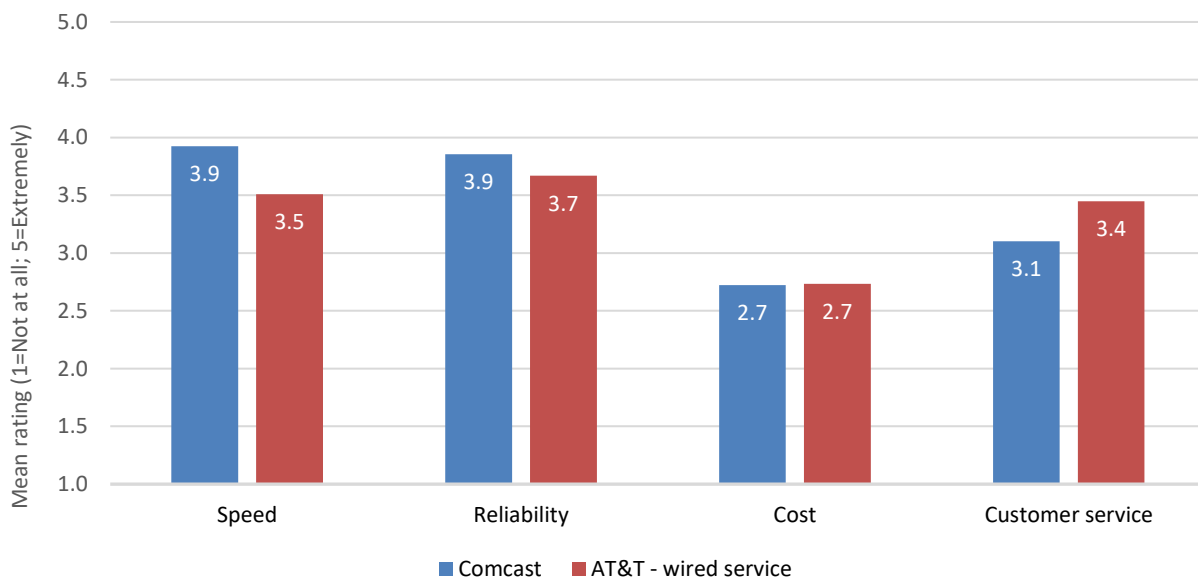
As illustrated in Table 17, Comcast is better meeting customer expectations for connection speed compared with AT&T wired service. The leadings ISPs in the market area are performing equally as well for other service aspects.

Table 17: Gap Index Score by Connection

	Satisfaction / Importance Gap Index*			
	Speed	Reliability	Cost	Customer Service
Comcast	85%	79%	60%	74%
AT&T wired	75%	76%	58%	76%
ISP Average	82%	78%	60%	75%
Percent of expectations met = Satisfaction / Importance				

3.6.1.8 *Internet use by location*

Respondents, including those without home or mobile internet service, were asked to indicate how often they use the internet in various locations, as illustrated in Figure 33. Most respondents (93 percent) use the internet in their home daily, and 50 percent use the internet at their work daily. One-fourth of respondents make daily use of the internet inside a school or college/ university building, while 55 percent do not use the internet at all at this type of location.

Figure 33: Use of the Internet at Various Locations
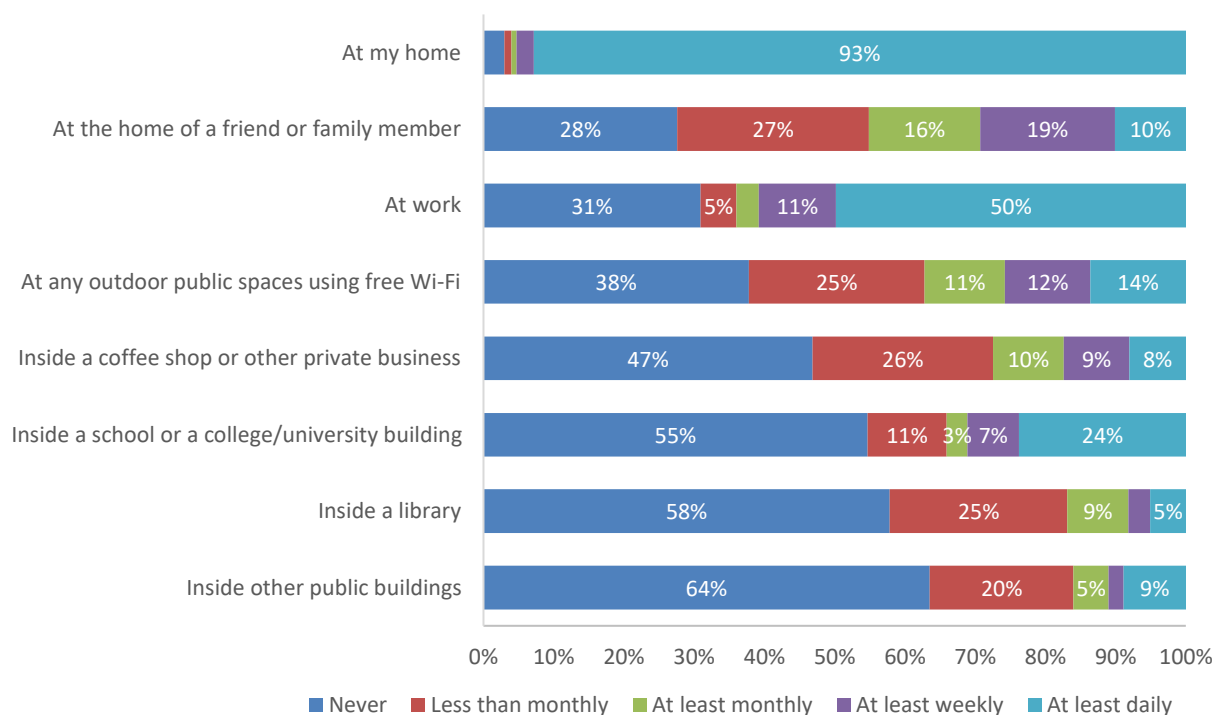
3.6.1.9 *Internet use by location by respondent age*

As illustrated in Table 18, respondents ages 65 and older are less likely than younger respondents to make use of the internet at various locations. Notably, 85 percent of seniors use the internet at home daily, compared with over nine in 10 younger respondents. Two-thirds of respondents ages 18 to 34 years use the internet at work daily.

Table 18: Internet Use by Location by Respondent Age

		18 to 34 years	35 to 44 years	45 to 54 years	55 to 64 years	65 years and older
At my home	Never	3%	1%	0%	3%	7%
	Less than monthly	0%	3%	1%	0%	1%
	At least monthly	0%	0%	0%	2%	1%
	At least weekly	2%	0%	2%	2%	6%
	At least daily	95%	96%	97%	93%	85%
	Weighted count	*149*	*96*	*72*	*81*	*85*
At the home of a friend or family member	Never	12%	20%	33%	38%	49%
	Less than monthly	18%	33%	26%	33%	33%
	At least monthly	20%	21%	19%	11%	7%
	At least weekly	33%	20%	14%	11%	7%
	At least daily	18%	7%	8%	8%	4%
	Weighted count	*148*	*91*	*68*	*80*	*81*
At work	Never	14%	15%	26%	41%	76%
	Less than monthly	3%	10%	5%	3%	7%
	At least monthly	2%	9%	2%	2%	1%
	At least weekly	16%	11%	10%	12%	2%
	At least daily	66%	55%	58%	42%	13%
	Weighted count	*148*	*92*	*68*	*78*	*77*
Inside a school or a college/university building	Never	39%	43%	46%	76%	84%
	Less than monthly	16%	11%	11%	8%	5%
	At least monthly	2%	4%	3%	6%	2%
	At least weekly	14%	5%	5%	2%	3%
	At least daily	29%	37%	34%	8%	6%
	Weighted count	*150*	*91*	*69*	*79*	*80*
Inside a coffee shop or other private business	Never	41%	37%	46%	44%	73%
	Less than monthly	22%	37%	24%	32%	16%
	At least monthly	10%	6%	16%	13%	8%
	At least weekly	15%	8%	8%	9%	2%
	At least daily	13%	12%	7%	2%	1%
	Weighted count	*153*	*90*	*67*	*79*	*81*
Inside a library	Never	53%	47%	52%	65%	77%
	Less than monthly	29%	34%	30%	18%	13%
	At least monthly	6%	13%	8%	12%	7%
	At least weekly	3%	2%	5%	4%	2%
	At least daily	10%	5%	5%	2%	1%
	Weighted count	*148*	*90*	*68*	*80*	*80*
Inside other public buildings such as a municipal office or senior center	Never	53%	58%	64%	68%	80%
	Less than monthly	21%	24%	22%	23%	12%
	At least monthly	4%	8%	4%	4%	5%
	At least weekly	3%	3%	1%	1%	1%
	At least daily	20%	6%	7%	3%	1%
	Weighted count	*143*	*92*	*66*	*79*	*81*

3.6.1.10 *Internet use by location by household income*

Respondents with a household income of $50,000 or more are more likely than those in lower-income households to make daily use of the internet at home or at work, and they are less likely to make use of the internet inside the home of a friend or family member, an educational institution, private business, library, or other public buildings (Table 19).

Table 19: Internet Use by Location by Household Income

		Less than $25,000	$25,000 to $49,999	$50,000 +
At my home	Never	7%	5%	0%
	Less than monthly	0%	2%	0%
	At least monthly	2%	1%	0%
	At least weekly	2%	1%	3%
	At least daily	88%	90%	97%
	Weighted count	*83*	*111*	*224*
At the home of a friend or family member	Never	32%	29%	23%
	Less than monthly	16%	23%	29%
	At least monthly	11%	10%	23%
	At least weekly	29%	20%	18%
	At least daily	13%	19%	6%
	Weighted count	*75*	*103*	*223*
At work	Never	46%	29%	18%
	Less than monthly	1%	7%	5%
	At least monthly	1%	5%	3%
	At least weekly	13%	12%	12%
	At least daily	39%	47%	62%
	Weighted count	*76*	*102*	*221*
Inside a school or a college/university building	Never	47%	45%	57%
	Less than monthly	6%	19%	10%
	At least monthly	0%	1%	4%
	At least weekly	19%	3%	6%
	At least daily	29%	32%	24%
	Weighted count	*81*	*105*	*218*
Inside a coffee shop or other private business	Never	44%	43%	44%
	Less than monthly	17%	25%	33%
	At least monthly	8%	11%	10%
	At least weekly	12%	9%	9%
	At least daily	19%	11%	5%
	Weighted count	*82*	*103*	*222*
Inside a library	Never	43%	45%	64%
	Less than monthly	26%	28%	27%
	At least monthly	11%	16%	6%
	At least weekly	7%	3%	1%
	At least daily	12%	8%	2%
	Weighted count	*77*	*102*	*221*
Inside other public buildings such as a municipal office or senior center	Never	49%	55%	68%
	Less than monthly	36%	19%	18%
	At least monthly	4%	9%	3%
	At least weekly	0%	4%	2%
	At least daily	11%	13%	9%
	Weighted count	*73*	*104*	*220*

Notably, three in 10 respondents earning under $25,000 per year make use of the internet weekly or daily inside a coffee shop or private business. Nearly one-half of respondents in low-income households make weekly or daily use of the internet at a school or college building, and one-fifth make weekly or daily use of the internet at a library. Additionally, 42 percent of those in low-income households use the internet either weekly or daily at the home of a family member or friend, compared with 24 percent of those earning $50,000 or more per year.

3.6.1.11 *Internet use by location by ethnicity*

As shown in Table 20, Hispanic/Latino respondents are more likely to make use of the internet at various locations compared with others. Hispanic/Latino respondents are also younger on average and more likely to have children in the household. Specifically, 36 percent of Hispanic/Latino respondents make daily use of the internet in a school or college building, compared with 14 percent of non-Hispanic/Latino respondents.

Table 20: Internet Use by Location by Ethnicity

		Non-Hispanic, Latino	Hispanic, Latino
At my home	Never	4%	1%
	Less than monthly	1%	1%
	At least monthly	1%	0%
	At least weekly	4%	1%
	At least daily	89%	97%
	Weighted count	*267*	*224*
At the home of a friend or family member	Never	32%	22%
	Less than monthly	29%	25%
	At least monthly	19%	12%
	At least weekly	14%	26%
	At least daily	7%	14%
	Weighted count	*265*	*209*
At work	Never	39%	21%
	Less than monthly	4%	7%
	At least monthly	3%	4%
	At least weekly	7%	16%
	At least daily	48%	52%
	Weighted count	*261*	*209*
Inside a school or a college/university building	Never	66%	41%
	Less than monthly	11%	11%
	At least monthly	4%	2%
	At least weekly	6%	9%
	At least daily	14%	36%
	Weighted count	*260*	*217*
Inside a coffee shop or other private business	Never	53%	39%
	Less than monthly	27%	24%
	At least monthly	9%	12%
	At least weekly	9%	9%
	At least daily	2%	16%
	Weighted count	*264*	*214*

		Non-Hispanic, Latino	Hispanic, Latino
Inside a library	Never	66%	47%
	Less than monthly	23%	29%
	At least monthly	7%	11%
	At least weekly	4%	2%
	At least daily	1%	11%
	Weighted count	*264*	*208*
Inside other public buildings such as a municipal office or senior center	Never	68%	58%
	Less than monthly	20%	21%
	At least monthly	4%	6%
	At least weekly	3%	1%
	At least daily	5%	14%
	Weighted count	*264*	*204*

3.6.1.12 Internet use by location by children in household

Similarly, individuals living in households with children are more likely than those without children to use the internet at various locations (see Table 21). Forty-five percent of those with children in their household make daily use of the internet in a school or college building.

Table 21: Internet Use by Location by Children in Household

		No Children in HH	Children in HH
At my home	Never	4%	1%
	Less than monthly	1%	1%
	At least monthly	1%	0%
	At least weekly	4%	0%
	At least daily	90%	98%
	Weighted count	*310*	*170*
At the home of a friend or family member	Never	32%	19%
	Less than monthly	30%	24%
	At least monthly	15%	17%
	At least weekly	15%	28%
	At least daily	8%	10%
	Weighted count	*300*	*162*
At work	Never	38%	18%
	Less than monthly	4%	7%
	At least monthly	3%	4%
	At least weekly	9%	15%
	At least daily	46%	56%
	Weighted count	*296*	*163*
Inside a school or a college/university building	Never	71%	29%
	Less than monthly	12%	11%
	At least monthly	3%	2%
	At least weekly	4%	13%
	At least daily	11%	45%
	Weighted count	*294*	*171*
Inside a coffee shop or other private business	Never	58%	28%
	Less than monthly	21%	35%
	At least monthly	10%	10%
	At least weekly	8%	11%
	At least daily	2%	16%
	Weighted count	*300*	*167*

		No Children in HH	Children in HH
Inside a library	Never	69%	38%
	Less than monthly	21%	35%
	At least monthly	7%	12%
	At least weekly	2%	5%
	At least daily	1%	10%
	Weighted count	*301*	*160*
Inside other public buildings such as a municipal office or senior center	Never	68%	55%
	Less than monthly	18%	26%
	At least monthly	3%	9%
	At least weekly	3%	1%
	At least daily	7%	9%
	Weighted count	*299*	*158*

3.6.2   Computer and internet skills

Respondents were asked a series of questions on how skilled they are using computers and the internet, as well as their interest in training to learn more about these topics. This information provides valuable insight into where there may be gaps in abilities and opportunities to educate residents.

3.6.2.1 Internet skills

Respondents were asked to indicate their level of agreement with various statements about their computer and internet skills. Average rating scores are highlighted in Figure 34, while Figure 35 shows detailed responses.

Overall, most respondents agreed that they know how to use the internet for various functions. More than eight in 10 respondents strongly agreed they have an email address and know how to use it and that they know how to access a website and search for information online. Three-fourths strongly agreed they can use the internet for accessing a bank account online.

Two-thirds of respondents strongly agreed they know how to connect to their doctor or view medical results/records online. More than six in 10 respondents strongly agreed they can adjust privacy settings online or purchase groceries online. Another 56 percent of respondents strongly agreed that they know how to use the internet to access students' grades, work assignments, or other school communications.

More than four in 10 respondents strongly agreed they know how to use the internet to identify false or misleading information or to recognize and avoid phishing scams. Respondents were less likely to agree that they are skilled in creating and managing their own personal website.

Figure 34: Agreement with Statements About Internet Skills (Mean Ratings)

Statement	Mean Rating
Use/have an email address	4.7
Access a website and search for information	4.7
Access my bank account online	4.5
Connect with doctor or view results/records	4.2
Adjust privacy settings online	4.2
Purchase groceries online	4.1
Identify false or misleading information online	3.9
Recognize/avoid phishing scam	3.8
Use the internet to see student's grades etc.	3.7
Create/manage personal website	2.8

Mean Rating (1=Strongly Disagree and 5=Strongly Agree)

Figure 35: Agreement with Statements About Internet Skills

Statement	1 - Strongly Disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly Agree
Use/have an email address			3%	9%	85%
Access a website and search for information			5%	11%	81%
Access my bank account online	6%			12%	76%
Connect with doctor or view results/records	9%	5%	6%	14%	66%
Adjust privacy settings online	7%	5%	9%	17%	62%
Purchase groceries online	12%	4%	13%	10%	62%
Identify false or misleading information online	10%	6%	11%	28%	45%
Recognize/avoid phishing scam	11%	6%	15%	25%	43%
Use the internet to see student's grades etc.	22%	3%	10%	8%	56%
Create/manage personal website	34%	14%	18%	10%	25%

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3.6.2.1.1 Internet skills by respondent age

Older respondents were less likely than younger respondents to agree they are skilled in various uses of the internet (see Table 22 and Table 23). Respondents under age 35 are particularly skilled in internet uses compared with older respondents. Just 36 percent of respondents ages 65+ strongly agreed they know how to adjust their privacy settings, and just 22 percent strongly agreed they know how to recognize and avoid a phishing scam. Roughly one-third of respondents ages 45+ strongly agreed that they know how to identify false or misleading information online and find credible sources, compared with 67 percent of those under age 35.

Table 22: Agreement with Statements About Internet Skills (Mean Ratings) by Age

	< 35 years	35-44 years	45-54 years	55-64 years	65 + years
I know how to access a website and search for information online	4.7	4.6	4.1	3.8	3.2
I have an email address and know how to use it.	4.7	4.5	3.9	3.6	3.0
I know how to adjust my privacy settings online, such as on Facebook.	4.8	4.7	4.2	3.9	3.0
I know how to use the internet to see my student's grades, work assignments, or other school communications.	4.5	4.4	4.0	3.8	3.2
I know how to connect with my doctor or view my medical test results / records online.	4.8	4.6	3.9	3.6	2.8
I know how to access my bank account online to pay bills or depositing checks.	3.6	2.7	2.5	2.2	1.6
I know how to purchase groceries online.	4.5	4.2	3.7	3.7	3.0
I know how to create and manage my own personal website.	4.2	3.6	3.0	2.9	2.3
I know how to recognize and avoid a phishing scam.	4.9	4.6	4.5	4.1	3.6
I know how to identify false or misleading information online and find credible sources of information.	4.2	3.7	3.1	3.0	2.3

Table 23: Agreement with Statements About Internet Skills (% Strongly Agree) by Age

	< 35 years	35-44 years	45-54 years	55-64 years	65 + years
I know how to access a website and search for information online	94%	77%	79%	79%	65%
I have an email address and know how to use it.	97%	83%	86%	81%	70%
I know how to adjust my privacy settings online, such as on Facebook.	86%	63%	55%	50%	36%
I know how to use the internet to see my student's grades, work assignments, or other school communications.	83%	62%	59%	33%	13%
I know how to connect with my doctor or view my medical test results / records online.	83%	63%	63%	57%	51%
I know how to access my bank account online to pay bills or depositing checks.	90%	78%	74%	69%	60%
I know how to purchase groceries online.	77%	68%	61%	56%	36%
I know how to create and manage my own personal website.	42%	26%	15%	17%	6%
I know how to recognize and avoid a phishing scam.	72%	38%	28%	32%	22%
I know how to identify false or misleading information online and find credible sources of information.	67%	41%	35%	33%	31%

3.6.2.1.2 Internet skills by household income

Respondents in households earning under $50,000 were less likely than those in higher-income households to agree that they are skilled in various uses of the internet (see Table 24 and Table 25). Most respondents in low-income households (earning under $25,000 per year) strongly agreed they know how to access a website and search for information online (63 percent), have an email address and know how to use it (72 percent), and know how to access their bank account online (62 percent); however, agreement is significantly lower when compared with those earning $50,000 or more per year.

Additionally, fewer respondents in low-income households strongly agreed they know how to adjust privacy settings online (50 percent), recognize and avoid a phishing scam (32 percent), and identify false/misleading information online and find credible sources (29 percent).

Table 24: Agreement with Statements About Internet Skills (Mean Ratings) by Income

	Less than $25,000	$25,000-$49,999	$50,000 +
I know how to access a website and search for information online	4.3	4.6	4.9
I have an email address and know how to use it.	4.5	4.7	4.9
I know how to adjust my privacy settings online, such as on Facebook.	3.9	4.2	4.6
I know how to use the internet to see my student's grades, work assignments, or other school communications.	3.4	3.7	4.2
I know how to connect with my doctor or view my medical test results / records online.	3.9	3.9	4.6
I know how to access my bank account online to pay bills or depositing checks.	4.1	4.5	4.8
I know how to purchase groceries online.	3.7	3.9	4.4
I know how to create and manage my own personal website.	2.7	2.6	3.1
I know how to recognize and avoid a phishing scam.	3.3	3.6	4.2
I know how to identify false or misleading information online and find credible sources of information.	3.4	3.9	4.2

Table 25: Agreement with Statements About Internet Skills (% Strongly Agree) by Income

	Less than $25,000	$25,000-$49,999	$50,000 +
I know how to access a website and search for information online	63%	73%	91%
I have an email address and know how to use it.	72%	81%	93%
I know how to adjust my privacy settings online, such as on Facebook.	50%	60%	75%
I know how to use the internet to see my student's grades, work assignments, or other school communications.	43%	55%	71%
I know how to connect with my doctor or view my medical test results / records online.	55%	51%	82%
I know how to access my bank account online to pay bills or depositing checks.	62%	72%	87%
I know how to purchase groceries online.	48%	58%	74%
I know how to create and manage my own personal website.	21%	26%	29%
I know how to recognize and avoid a phishing scam.	32%	41%	54%
I know how to identify false or misleading information online and find credible sources of information.	29%	50%	54%

3.6.2.2 Computer and internet training

Respondents were also asked their level of agreement with various statements about receiving training related to computers and the internet. Average rating scores are highlighted in Figure 36, while Figure 37 shows detailed responses.

Overall, there is only slight to moderate interest in learning about or in attending a class about writing software/code or in learning how computers work. On average, there is moderate interest in becoming more confident in using computers, smartphones, and the internet, or in using online resources to find trustworthy information. However, there is somewhat less interest in attending a free or inexpensive class about these topics.

Figure 36: Agreement with Statements About Training Related to Computers and the Internet (Mean Ratings)
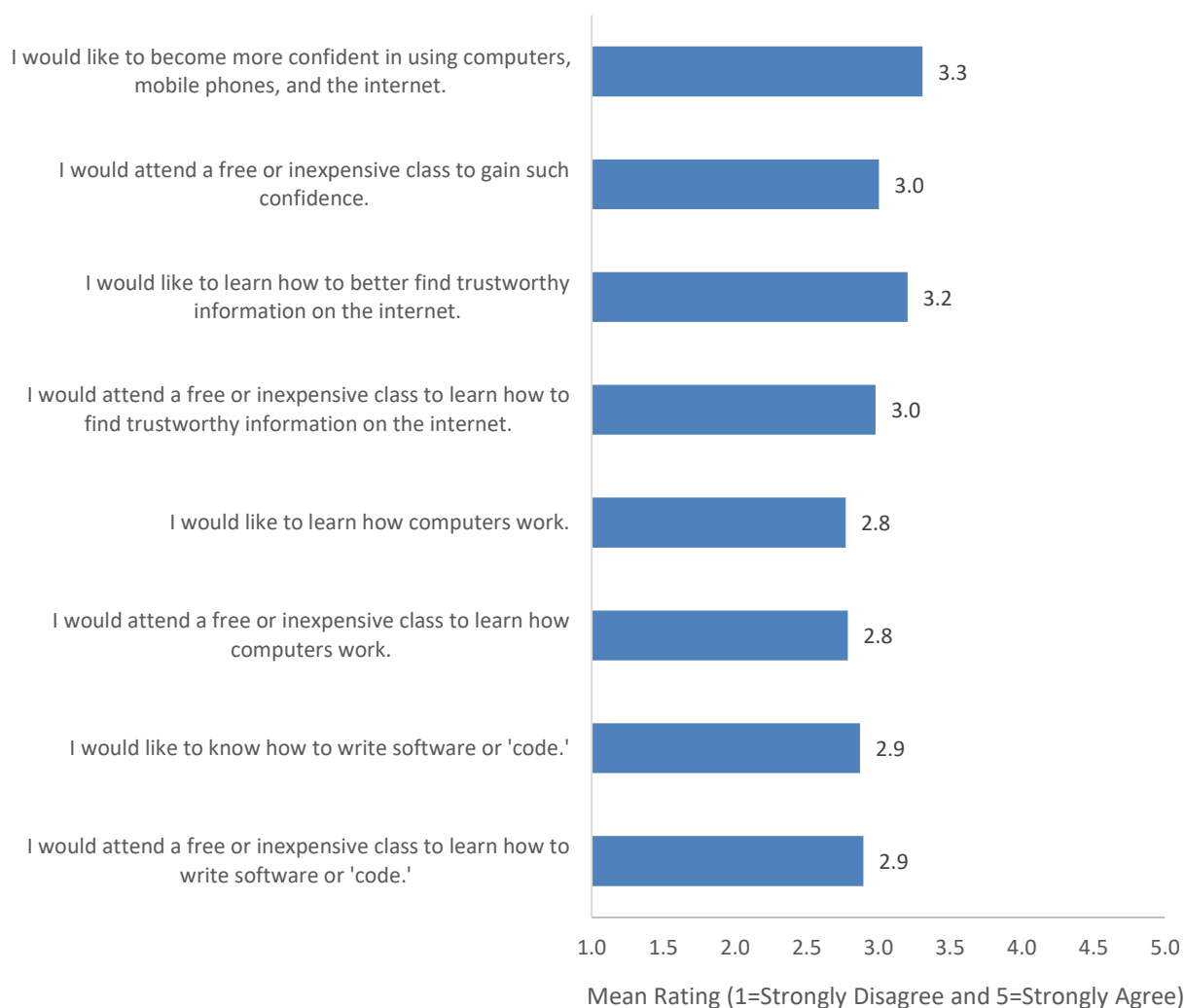
Mean Rating (1=Strongly Disagree and 5=Strongly Agree)

Specifically, 49 percent of respondents agreed or strongly agreed that they would like to become more confident in using computers and related technology, and 42 percent agreed or strongly agreed they would like to attend training.

Similarly, 47 percent of respondents agreed or strongly agreed about wanting to know how to better use online resources to find trustworthy information, and 43 percent agreed or strongly agreed they are interested in training while 42 percent disagreed or strongly disagreed.

Figure 37: Agreement with Statements About Training Related to Computers and the Internet
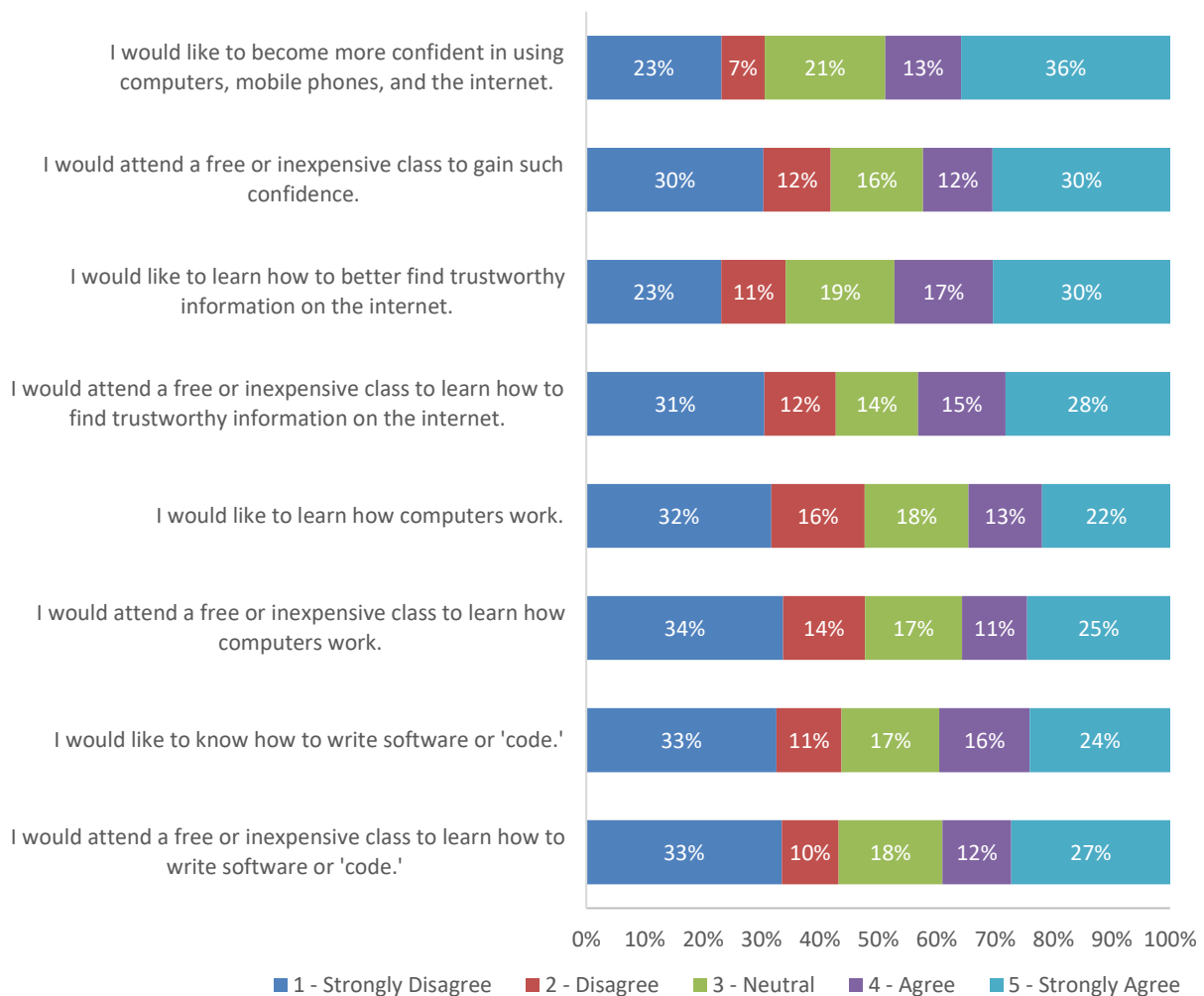
3.6.2.2.1 Interest in computers and training by respondent age

Interest in training varies significantly by age of respondent. As illustrated in Figure 38 and Figure 39, respondents ages 35+ expressed greater interest in becoming more confident in using computers and related technology and in learning how to better use online resources, as well as attending a class about these topics, compared with younger respondents. Those under age 55 are more likely than older respondents to agree they would like to learn how to write code or to take a class about this topic.

Figure 38: Agreement with Statements About Computers and Training by Respondent Age (Mean Ratings)
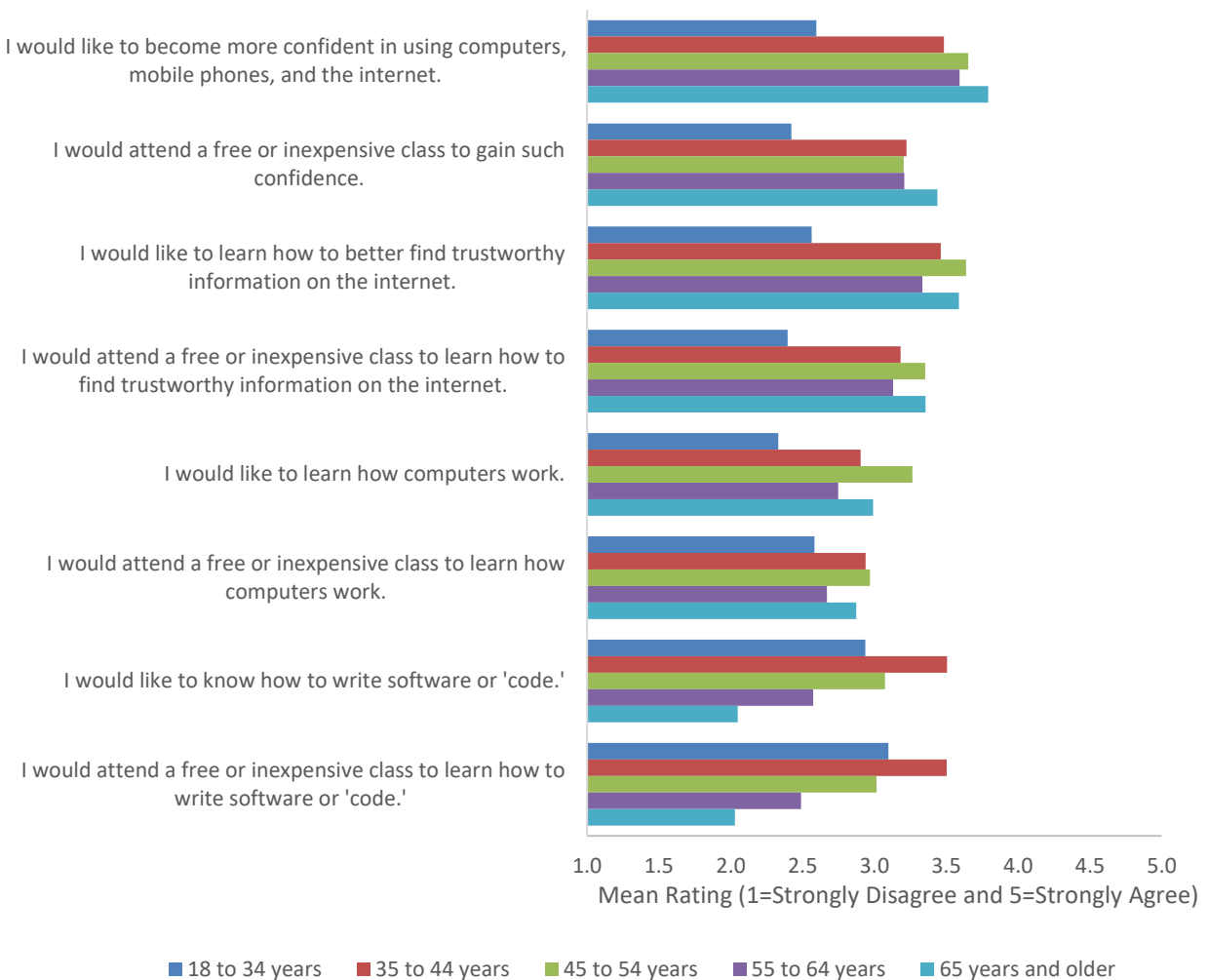
Figure 39: Agreement with Statements About Computers and Training by Respondent Age (% Strongly Agree)
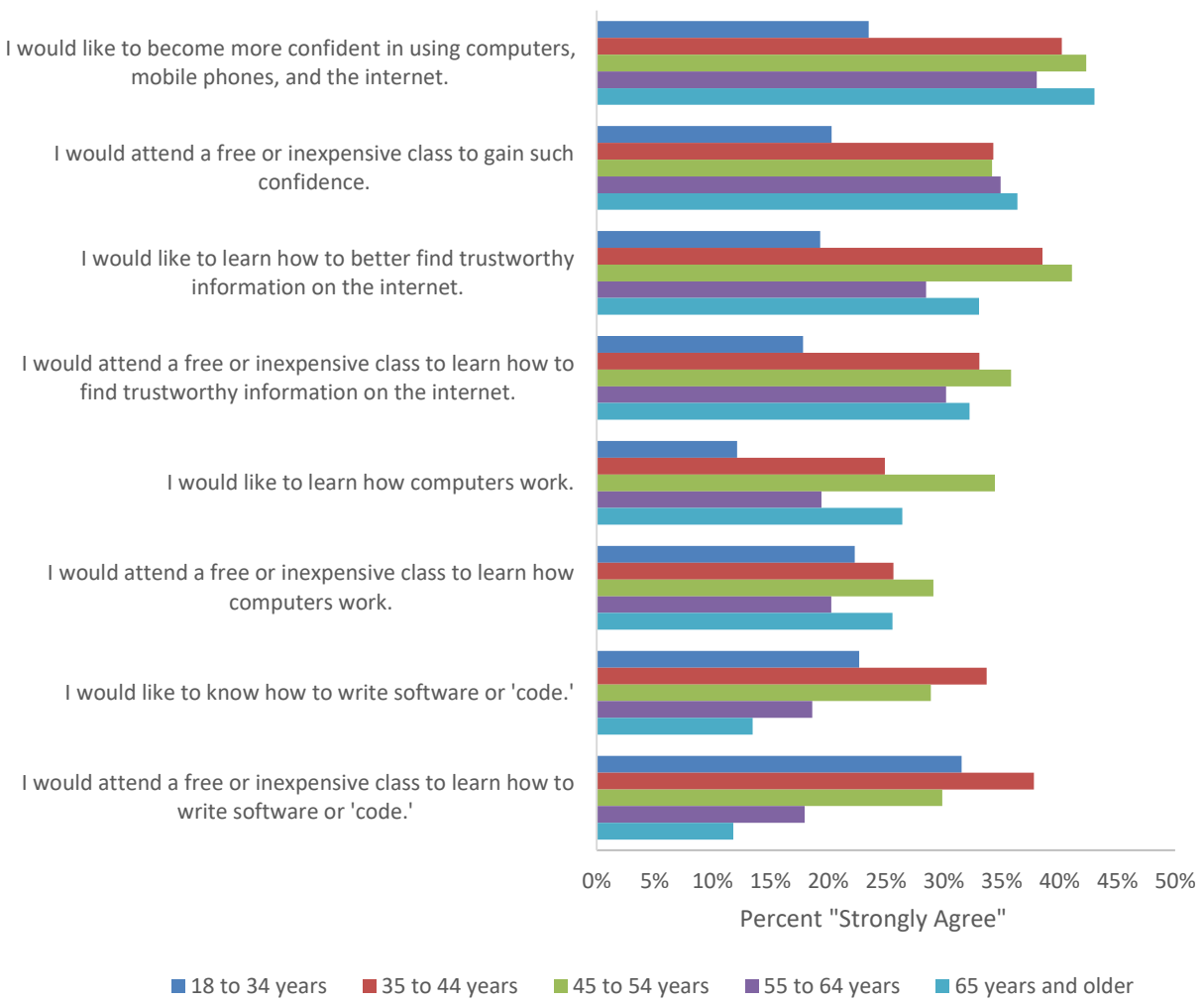
3.6.2.2.2 Interest in computers and training by household income

As illustrated in Figure 40 and Figure 41, agreement with the various statements about computer and internet training are correlated with household income. Those earning less than $50,000 per year were more likely than those earning $50,000 or more per year to agree that they would like to learn more or would attend training. Specifically, 53 percent of those earning under $25,000 per year and 50 percent of those earning $25,000 to $49,999 per year strongly agreed they would like to become more confident in using computers, mobile phones, and the internet.

Figure 40: Agreement with Statements About Computers and Training by Household Income (Mean Ratings)
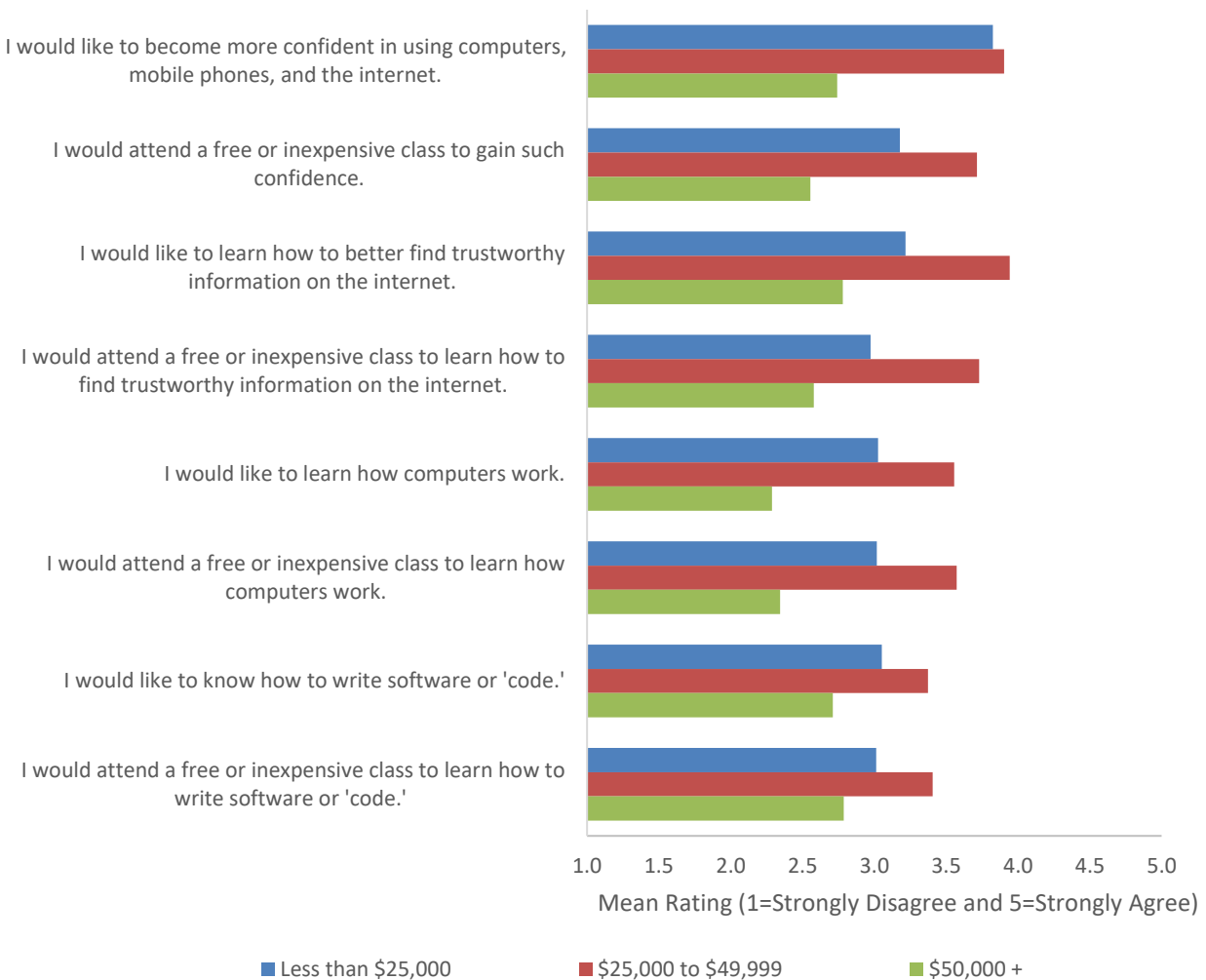
Figure 41: Agreement with Statements About Computers and Training by Household Income (% Strongly Agree)

Percent "Strongly Agree"

■ Less than $25,000   ■ $25,000 to $49,999   ■ $50,000 +

3.6.3   Internet Use for jobs/careers

Nearly one-half (46 percent) of respondents said their job requires them to have internet access at home, as illustrated in Figure 42. Another 29 percent said their job does not require home internet access, and 25 percent said it does not apply because they are retired or not employed at this time.

Figure 42: Job Requires Homes Internet Access by Connectivity
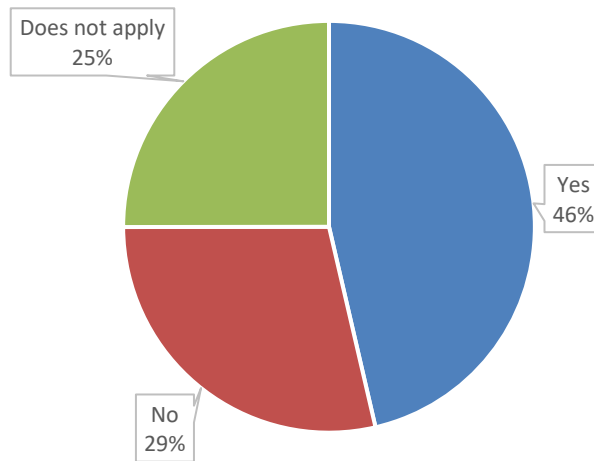
Need for internet access for a job is highly associated with respondent age, as may be expected, with those ages 65+ less likely to have a need (see Figure 43).

Figure 43: Job Requires Homes Internet Access by Respondent Age
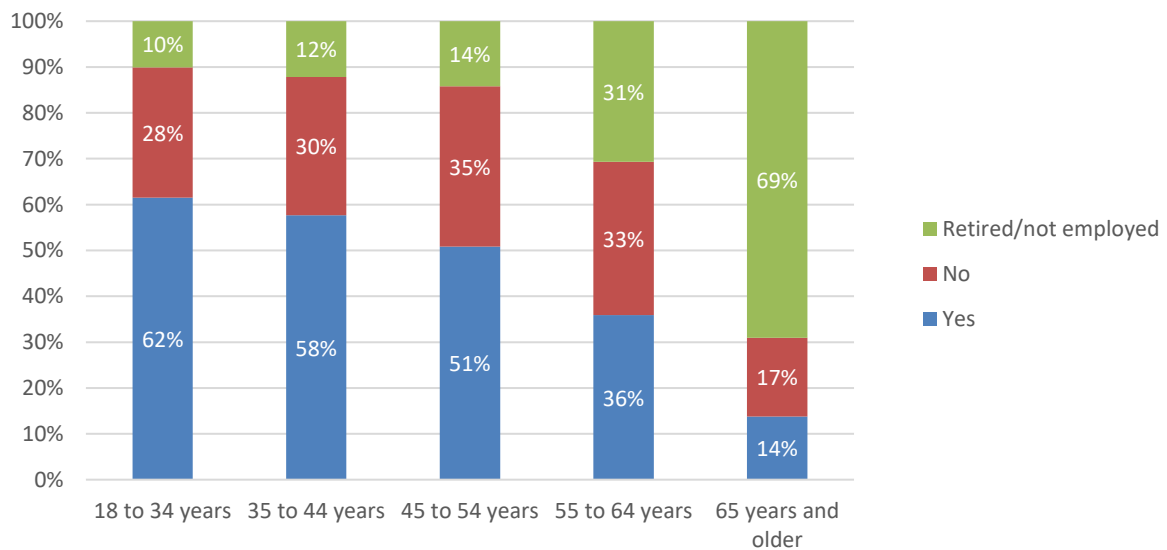
Need for home internet access for a job is also correlated with education and household income. Less educated and lower-income respondents are less likely to have a need, as shown in Figure 44 and Figure 45. Specifically, just 34 percent of those with a high school education or less said their job requires internet access at home, compared with at least one-half of those with a higher education level.

Figure 44: Job Requires Homes Internet Access by Education Level
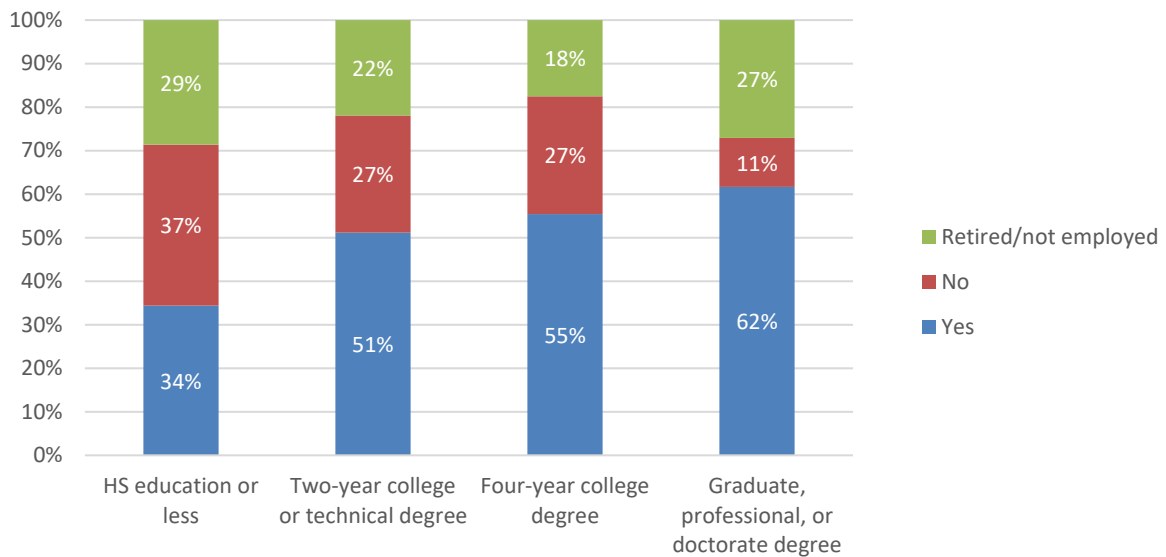
Similarly, 27 percent of those earning under $25,000 annually and 34 percent of those earning $25,000 to $49,999 annually said their job requires home internet access, compared with 65 percent of those who earn $50,000 or more per year.

Figure 45: Job Requires Homes Internet Access by Household Income
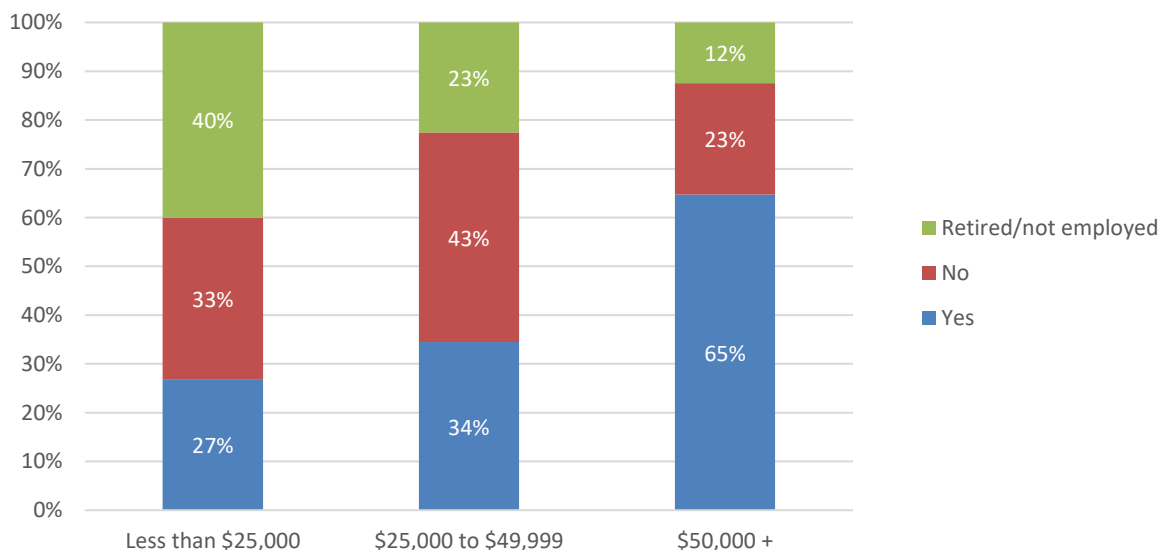
As shown in Figure 46, one-third of respondents indicated that someone in their household already teleworks from home, and another 11 percent would like to telework.

Figure 46: Household Member Teleworking
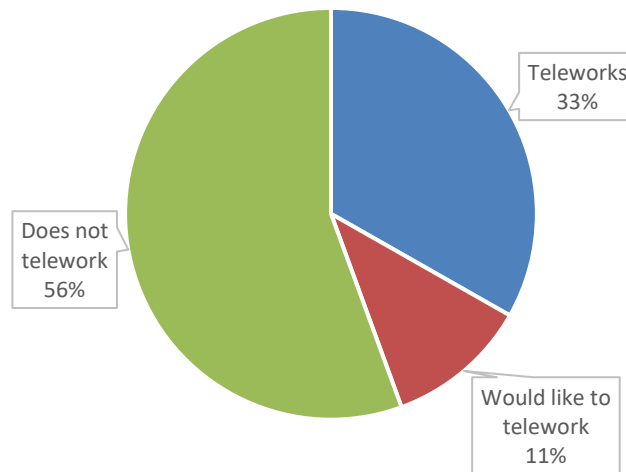
Respondents under age 65 are more likely than older respondents to have a household member who currently teleworks. Just 13 percent of those ages 65+ have a household member who teleworks (see Figure 47).

Figure 47: Teleworking Status by Respondent Age
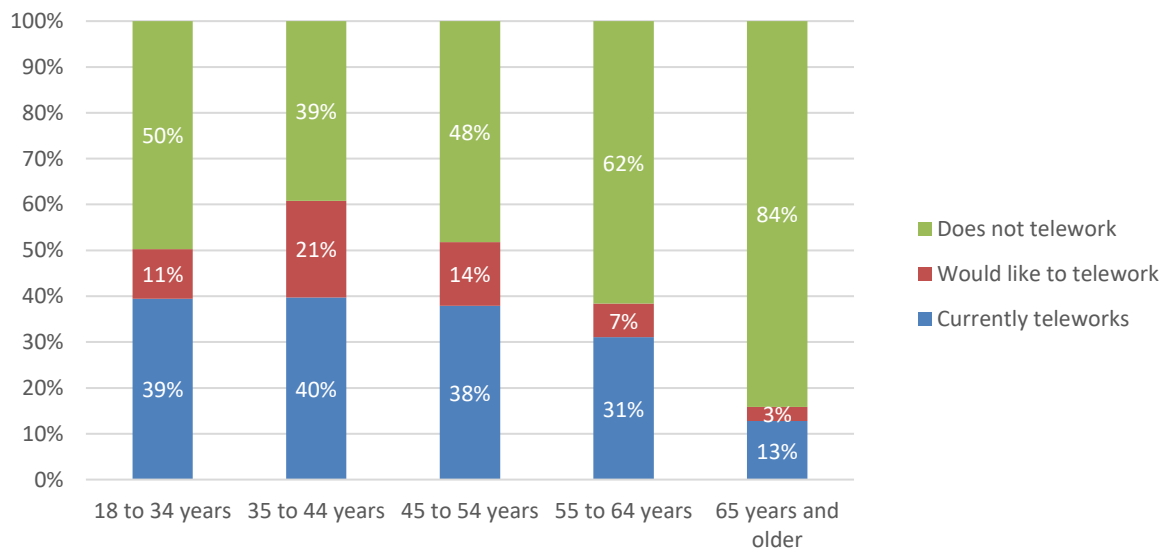
Respondents with a high school education or less are less likely than more educated respondents to have a household member who teleworks (see Figure 48). Approximately one-half of those with a college degree or a graduate degree have a household member who teleworks.

Figure 48: Teleworking Status by Education Level
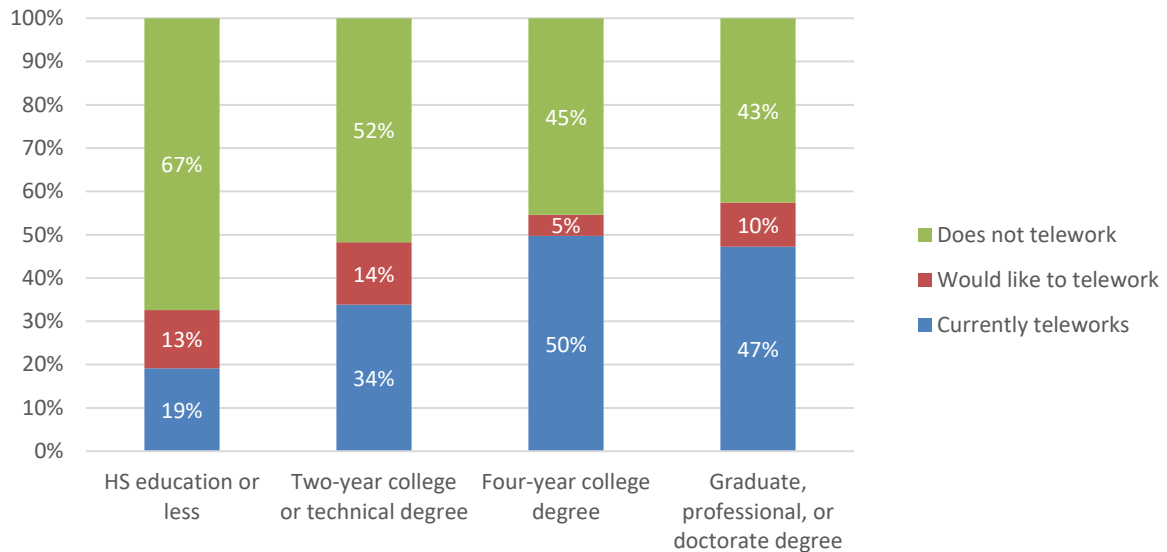
Additionally, one-half of those with a household income of $50,000 or more per year have a household member who teleworks, compared with 18 percent of those earning $25,000 to $49,999 per year and 8 percent of those earning under $25,000 per year (see Figure 49).

Figure 49: Teleworking Status by Household Income

Almost one-fifth of respondents either have a home-based business or are planning to start one within the next three years, as illustrated in Figure 50.

Figure 50: Own or Plan to Start a Home-Based Business
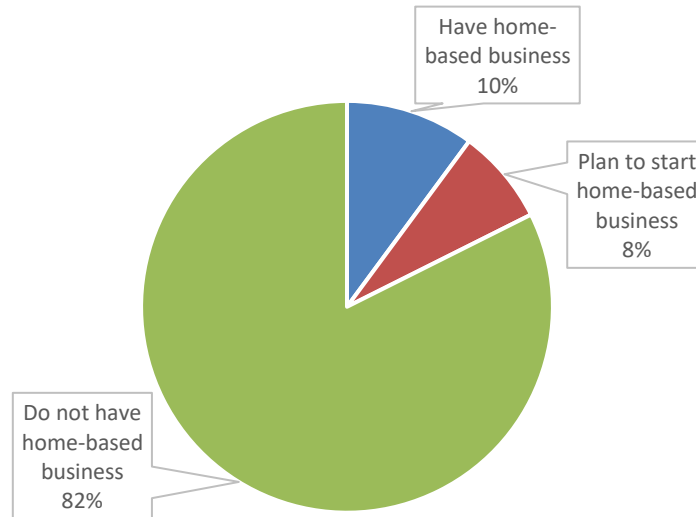
A high-speed data or internet connection is extremely important for most of those who telework (89 percent) and for those with a planned or existing home-based business (73 percent), as shown in Figure 51. Intuitively, those who do not telework or have a home-based business find the need for high-speed internet for these aspects to be less important.

Figure 51: Importance of High-Speed Internet for Teleworking

	Total		Those who telework/have home-based business	
	Teleworking	Home-Based Business	Teleworking	Home-Based Business
5 - Extremely important	64%	36%	89%	73%
4 - Very important	10%	8%	8%	14%
3 - Moderately important	7%	12%	3%	13%
2 - Slightly important	2%	6%	0%	0%
1 - Not at all important	17%	38%	0%	0%
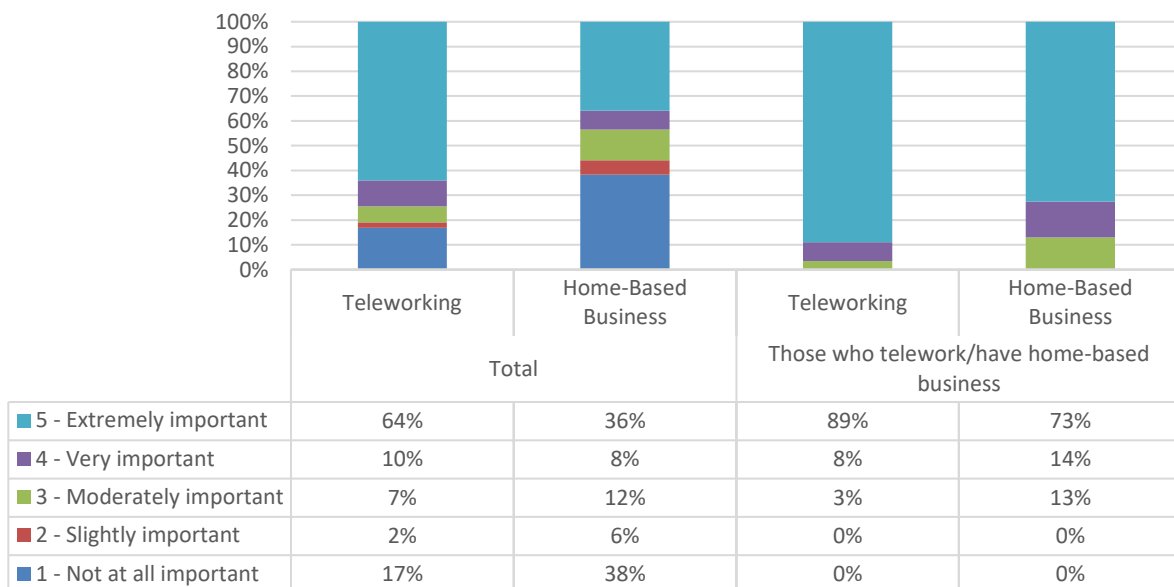
3.6.4 Internet use for education

Approximately one-half of households have a member who uses an internet connection for educational purposes, such as completing assignments, research, or study related to coursework or formal education (see Figure 52).

Figure 52: Use of Internet for Educational Purposes
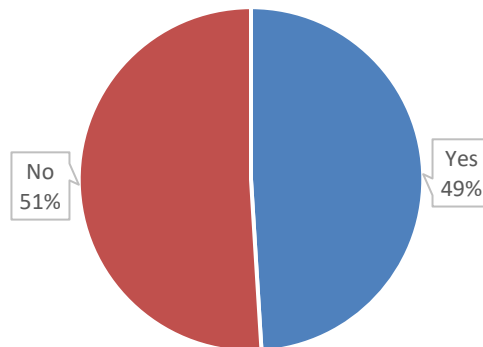
Most households with children ages 18 and younger (84 percent) use the internet for educational purposes, compared with 28 percent of households without children (see Figure 53).

Figure 53: Use of Internet for Educational Purposes by Children in Household
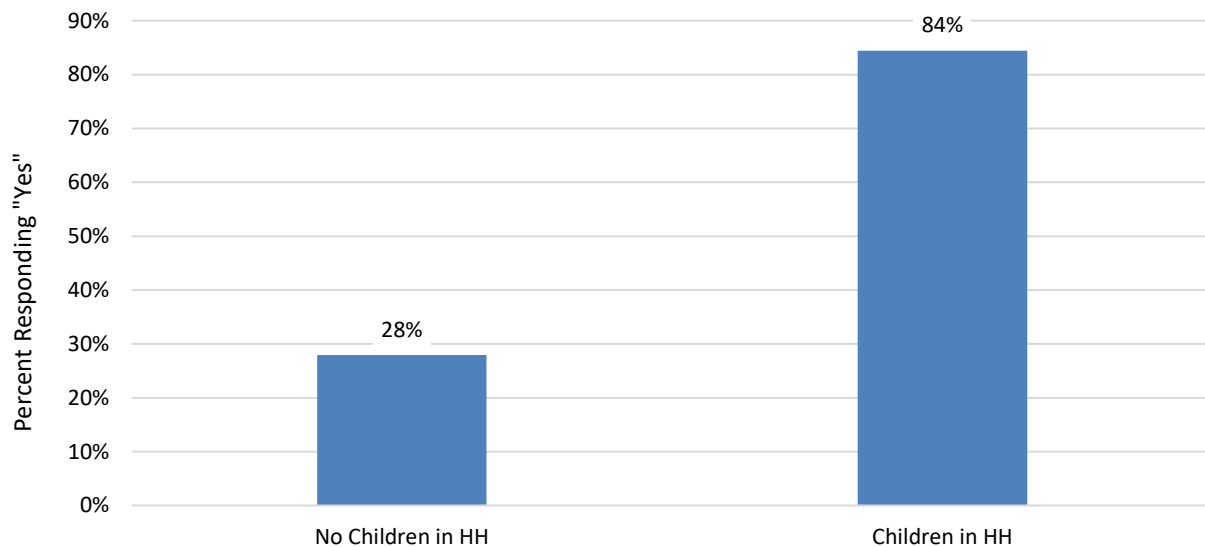
As seen in Figure 54, use of the internet for educational purposes is higher for younger respondents, who are also more likely to have children at home. Specifically, 73 percent of respondents ages 35 to 44 years said a household member uses the internet for educational purposes.

Figure 54: Use of Internet for Educational Purposes by Respondent Age
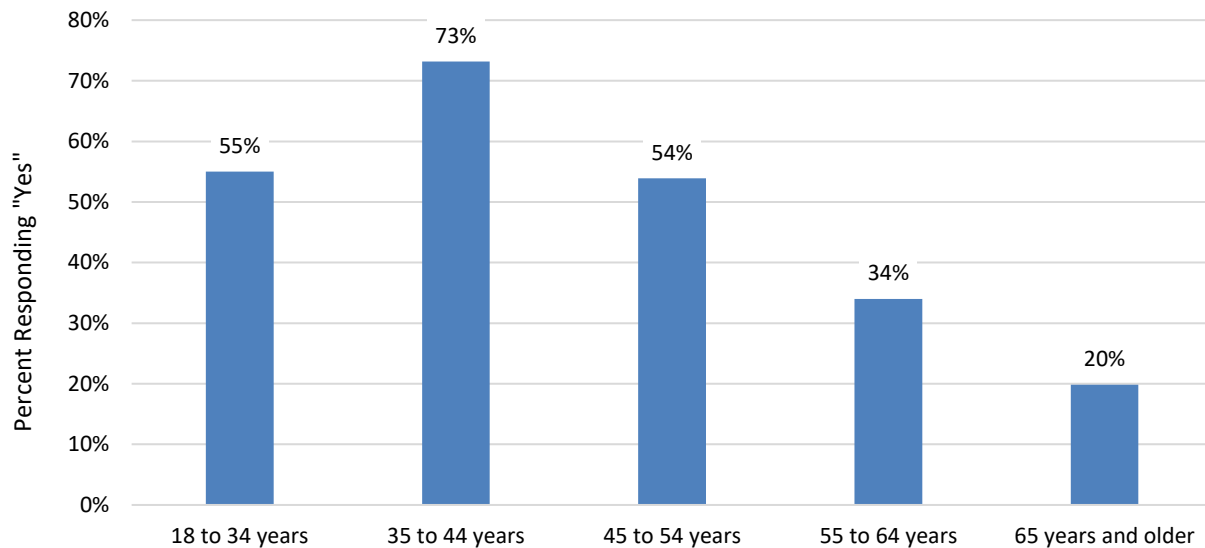
Fifty-eight percent of households earning under $25,000 per year have a member who uses the internet for educational purposes, compared with 48 percent of households earning $50,000 or more (see Figure 55). Low-income households are somewhat more likely to have children.

Figure 55: Use of Internet for Educational Purposes by Household Income
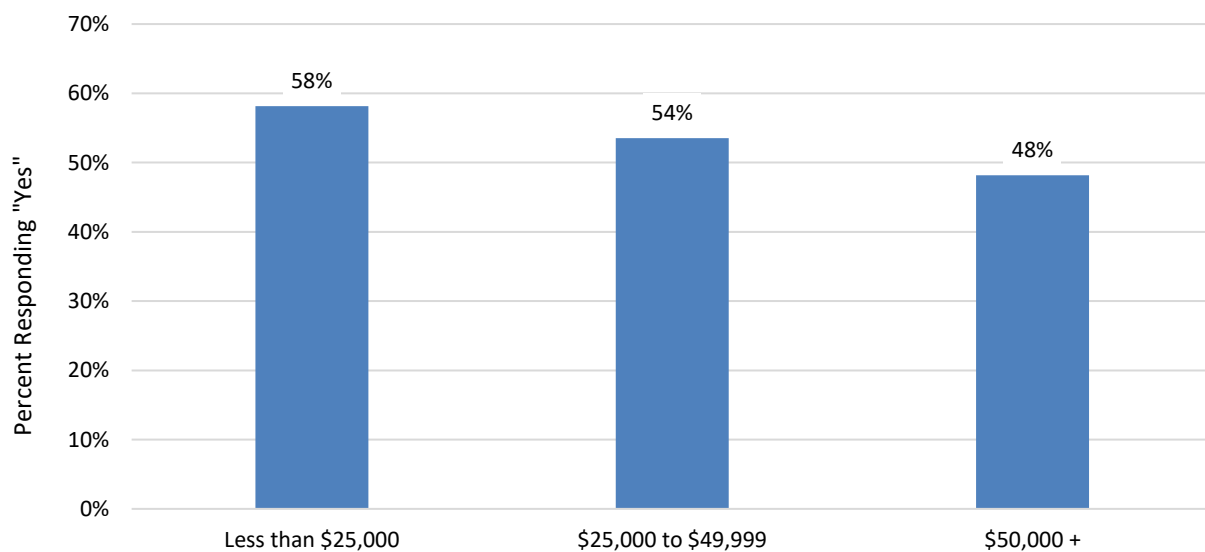
Two-thirds of Hispanic/Latino respondents have a household member who uses an internet connection for educational purposes, as shown in Figure 56.

Figure 56: Use of Internet for Educational Purposes by Ethnicity
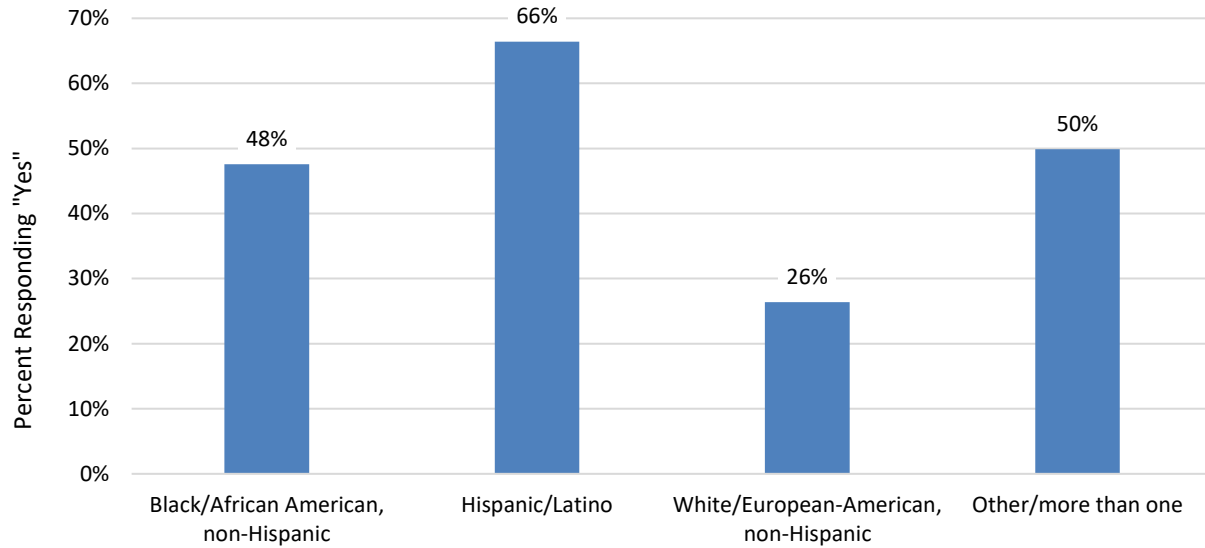
Respondents use the internet across a range of education levels. Among those who use the internet for educational purposes, 36 percent use it for primary education and 35 percent use it for secondary education (see Figure 57). One-fifth of respondents who use the internet for educational purposes do so for continuing/adult education.

Figure 57: Education Level for Which Internet Connection Is Used
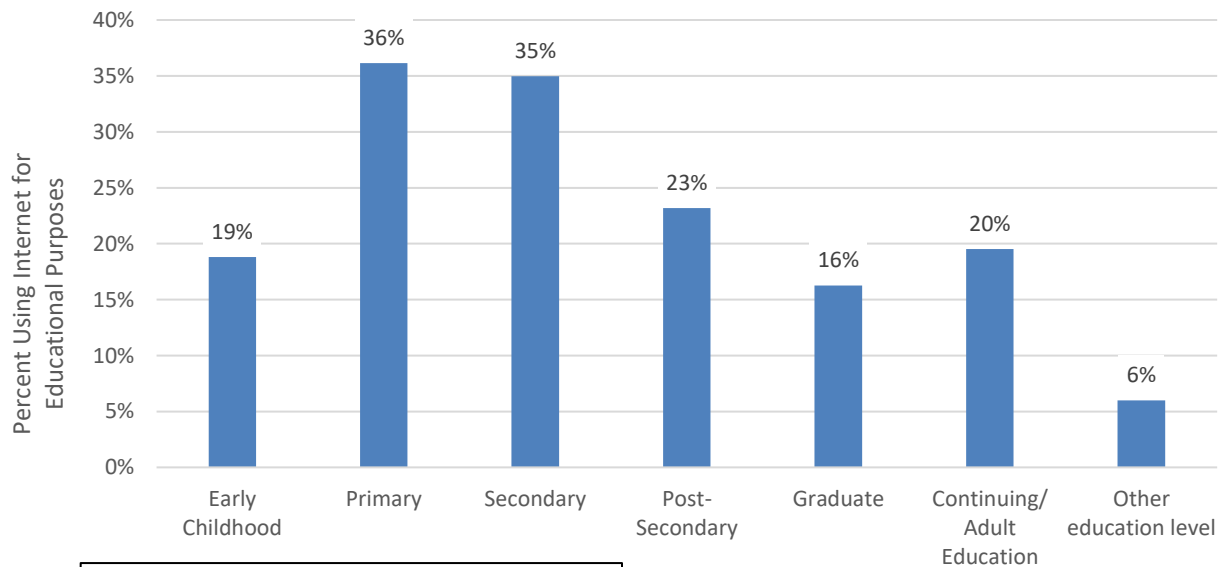
Respondents could select more than one response, and figures may add to more than 100%.

Use of the internet for educational purposes is related to presence of children in the household, as might be expected, particularly for early primary and secondary education needs. Those without children in the home are more likely to use the internet for post-secondary, graduate, and continuing education (see Figure 58).

Figure 58: Education Level for Which Internet Connection Is Used by Children in Household
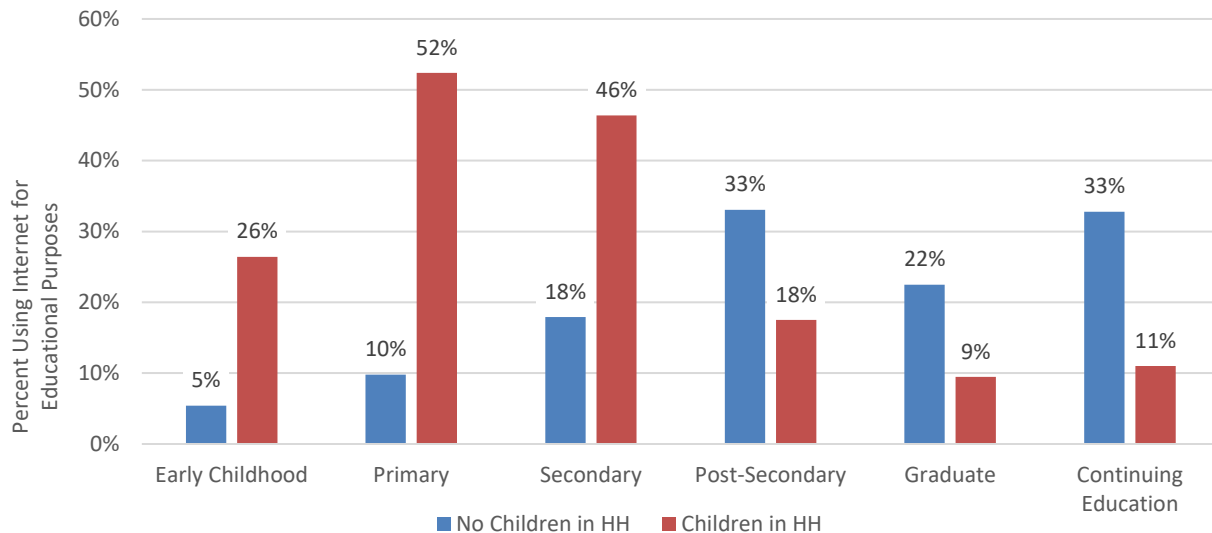
Among those who use the internet for educational purposes, 70 percent said a high-speed internet connection is extremely important and 23 percent said it is very important for their education needs (see Figure 59).

Figure 59: Importance of High-Speed Internet for Education Needs
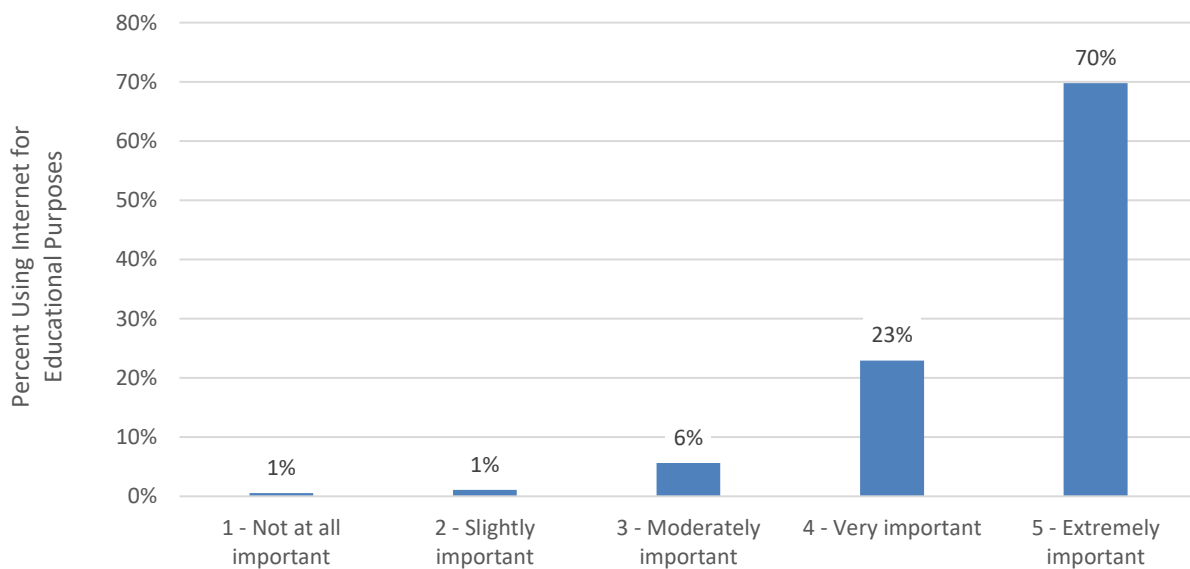
3.6.5 Technology for minor children

Just 32 percent of the weighted total of respondents said they are the parent, guardian, or primary caretaker of children or grandchildren under the age of 18. Nearly three-fourths (74 percent) of respondents ages 35 to 44 years and 50 percent of respondents ages 45 to 54 years are a parent, guardian, or caretaker. Additionally, 51 percent of Hispanic/Latino respondents and 43 percent of those earning under $25,000 per year are a parent, guardian, or caretaker.

3.6.6 Use of technology

Respondents who are the parent, legal guardian, or primary caretaker for any child or grandchild under the age of 18 were asked their level of agreement with statements about how their minor child is able to make beneficial use of technology. Average rating scores are highlighted in Figure 60, while Figure 61 shows detailed responses.

Most respondents agreed or strongly agreed that their children use the internet in positive and beneficial ways (89 percent) and that they can complete their homework using available devices and internet connection (80 percent).

Although most respondents with minor children agreed that they are able to mitigate risks online, a sizeable segment disagreed or strongly disagreed that their children are able to avoid bullying on the internet by their peers (17 percent), avoid exposure to graphic pornography or violence online (24 percent), and detect and avoid false or misleading information online (26 percent).

Figure 60: Agreement with Statements About Children's Use of Technology (Mean Ratings)

Statement	Mean Rating
I feel that in general, my children or grandchildren use the internet in positive and beneficial ways.	4.4
I feel that my children or grandchildren under my care are able to complete their homework using internet connections and devices available in our home.	4.3
I feel that my children or grandchildren are able to avoid bullying on the internet by peers.	3.8
I feel that my children or grandchildren are able to avoid exposure to graphic violence or pornography online.	3.6
I feel that my children or grandchildren have the skills to detect and avoid false or misleading information online.	3.3

Mean Rating (1=Strongly Disagree and 5=Strongly Agree)

Figure 61: Agreement with Statements About Children's Use of Technology

Statement	1 - Strongly Disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly Agree
I feel that in general, my children or grandchildren use the internet in positive and beneficial ways.			9%	32%	57%
I feel that my children or grandchildren under my care are able to complete their homework using internet connections and devices available in our home.			17%	23%	57%
I feel that my children or grandchildren are able to avoid bullying on the internet by peers.	7%	10%	20%	25%	38%
I feel that my children or grandchildren are able to avoid exposure to graphic violence or pornography online.	12%	12%	11%	30%	35%
I feel that my children or grandchildren have the skills to detect and avoid false or misleading information online.	12%	14%	32%	18%	24%

■ 1 - Strongly Disagree   ■ 2 - Disagree   ■ 3 - Neutral   ■ 4 - Agree   ■ 5 - Strongly Agree

80

Furthermore, those residing in higher poverty neighborhoods were less likely to agree their children use the internet in positive and beneficial ways, can complete their homework with available devices and internet connection, and are able to avoid online risks (see Figure 62).

Figure 62: Agreement with Statements About Children's Use of Technology by Residence

Mean Rating (1=Strongly Disagree and 5=Strongly Agree)

■ Higher poverty census tracts   ■ Lower poverty census tracts
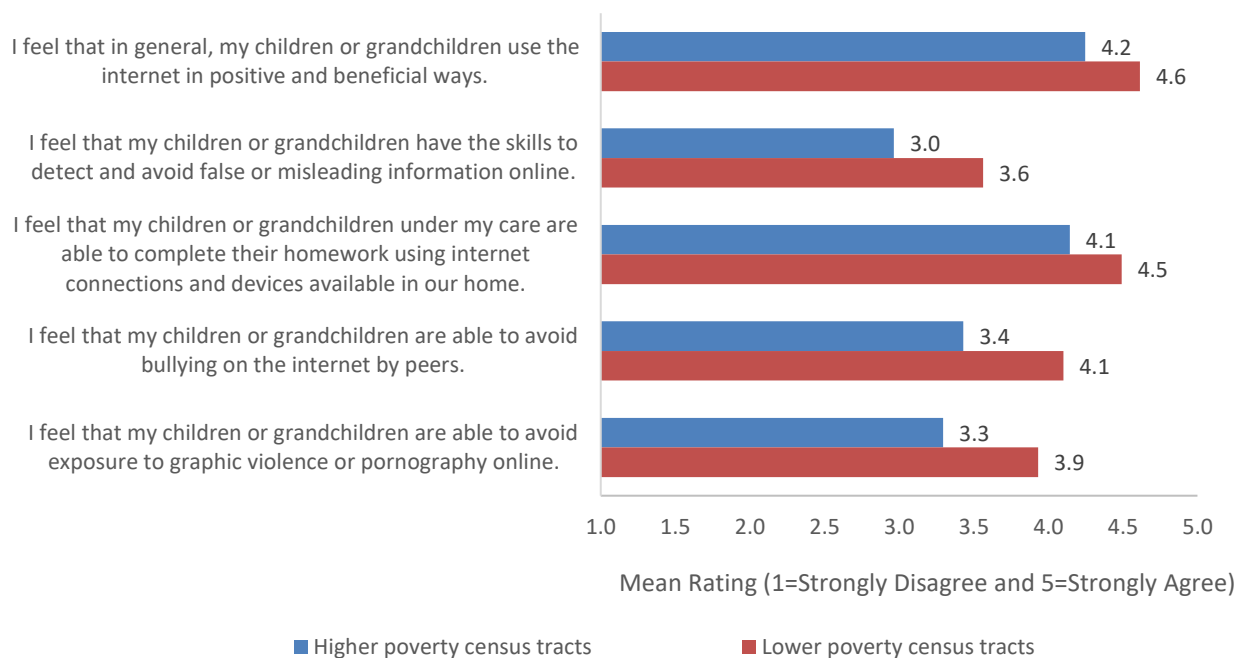
Specifically, a sizeable segment of those in higher poverty neighborhoods disagreed or strongly disagreed their children have skills to detect and avoide false or misleading information online (37 percent), are able to avoid bullying on the internet by their peers (27 percent), and are able to avoid exposure to graphic violence or pornograpy online (35 percent). Table 26 highlights the level of agreement with statements about the use of technology by minor children in the household, for those in higher poverty and lower poverty areas.

Table 26: Agreement with Statements About Technology for Minor Children by Area of Residence (Higher/Lower Poverty Census Tracts)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
I feel that in general, my children or grandchildren use the internet in positive and beneficial ways.						
Higher Poverty Neighborhoods	1%	0%	15%	39%	44%	*71*
Lower Poverty Neighborhoods	1%	0%	4%	26%	69%	*77*
I feel that my children or grandchildren have the skills to detect and avoid false or misleading information online.						
Higher Poverty Neighborhoods	14%	23%	33%	13%	17%	*69*

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Lower Poverty Neighborhoods	10%	7%	32%	21%	31%	*79*
I feel that my children or grandchildren under my care are able to complete their homework using internet connections and devices available in our home.						
Higher Poverty Neighborhoods	4%	2%	17%	31%	47%	*72*
Lower Poverty Neighborhoods	1%	0%	15%	15%	68%	*79*
I feel that my children or grandchildren are able to avoid bullying on the internet by peers.						
Higher Poverty Neighborhoods	14%	13%	17%	27%	29%	*70*
Lower Poverty Neighborhoods	1%	5%	24%	24%	47%	*79*
I feel that my children or grandchildren are able to avoid exposure to graphic violence or pornography online.						
Higher Poverty Neighborhoods	18%	17%	11%	23%	30%	*70*
Lower Poverty Neighborhoods	6%	8%	11%	36%	39%	*79*
Row percentages (read across rows)						

3.6.7 Respondent information

Basic demographic information was gathered from survey respondents and is summarized in this section. Several comparisons of respondent demographic information and other survey questions were provided previously in this report.

As indicated previously regarding age-weighting, disproportionate shares of survey respondents were in the older age cohorts relative to the area's adult population as a whole (see Figure 63). Similarly, the data were weighted to account for differences in response by household income and by ethnicity. The weighted survey results presented in this report are adjusted to account for these differences and to provide results that are more representative of the area's population, as discussed previously.

Figure 63: Age of Respondents and Waukegan Adult Population
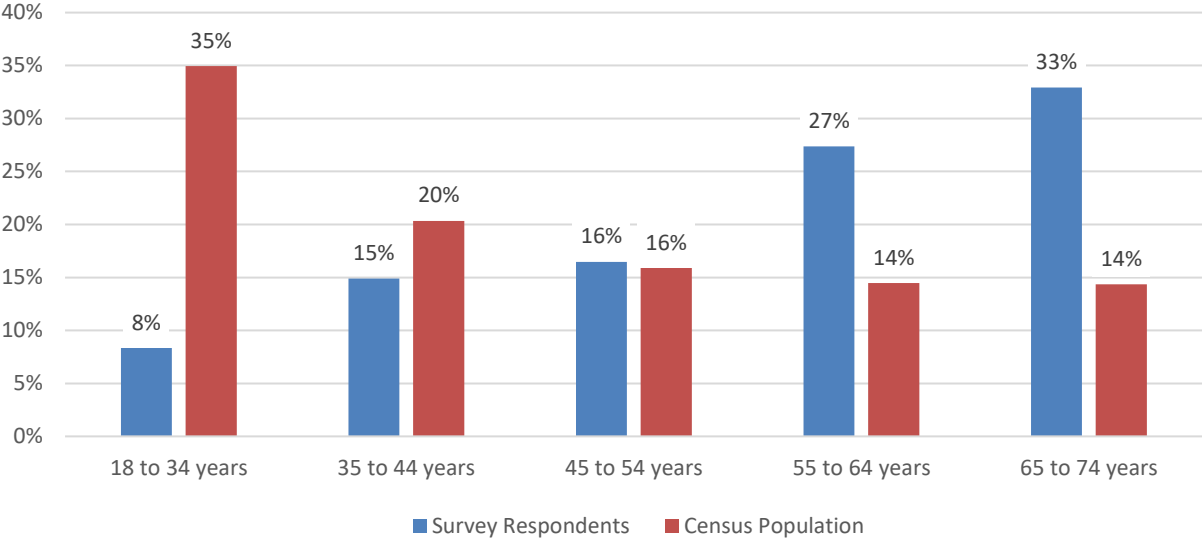
Table 27 highlights the demographic characteristics of survey respondents, broken out by respondent age. Respondents under age 55 are more likely than older respondents to have children under age 18 living in the home/have multiple household members. They are also more likely to be Hispanic/Latino. Conversely, older respondents are more likely than younger respondents to live alone or with one other household member.

Table 27: Demographic Profile by Respondent Age

Age Cohort		< 35	35-44	45-54	55-64	65+	Total
Education	HS education or less	43%	56%	40%	35%	37%	42%
	Two-year college or technical degree	18%	20%	19%	19%	20%	19%
	Four-year college degree	27%	12%	25%	27%	22%	23%
	Graduate, professional, or doctorate degree	12%	12%	16%	20%	22%	16%
	Total	*154*	*97*	*78*	*83*	*91*	*508*
Household Income	Less than $25,000	22%	19%	22%	19%	21%	21%
	$25,000 to $49,999	25%	27%	26%	21%	31%	26%
	$50,000 +	53%	54%	52%	60%	47%	53%
	Total	*151*	*88*	*69*	*63*	*62*	*436*
Race/Ethnicity	Black/African American, non-Hispanic	4%	9%	9%	21%	15%	11%
	Hispanic, Latino	62%	61%	50%	27%	13%	45%
	White/European-American, non-Hispanic	22%	24%	35%	43%	64%	35%
	Other/more than one	11%	6%	7%	10%	7%	9%
	Total	*154*	*96*	*78*	*81*	*89*	*503*
Household Size	One HH member	11%	8%	16%	24%	34%	18%
	Two HH members	26%	16%	26%	42%	53%	32%
	Three HH members	27%	18%	18%	14%	7%	18%
	Four + HH members	36%	57%	40%	19%	6%	33%
	Total	*149*	*96*	*77*	*81*	*91*	*498*
Children in Household	No Children in HH	53%	37%	58%	89%	96%	65%
	Children in HH	47%	63%	42%	11%	4%	35%
	Total	*149*	*96*	*77*	*81*	*91*	*498*
Own/Rent Residence	Own	44%	60%	76%	79%	84%	65%
	Rent/live with family/other	56%	40%	24%	21%	16%	35%
	Total	*154*	*97*	*77*	*83*	*92*	*508*

The respondents' highest level of education attained is summarized in Figure 64. More than four in 10 respondents have a high school education or less, and another 19 percent have a two-year college or technical degree. Approximately four in 10 have a four-year college degree (23 percent) or a graduate, professional, or doctor degree (16 percent).

Figure 64: Education of Respondent
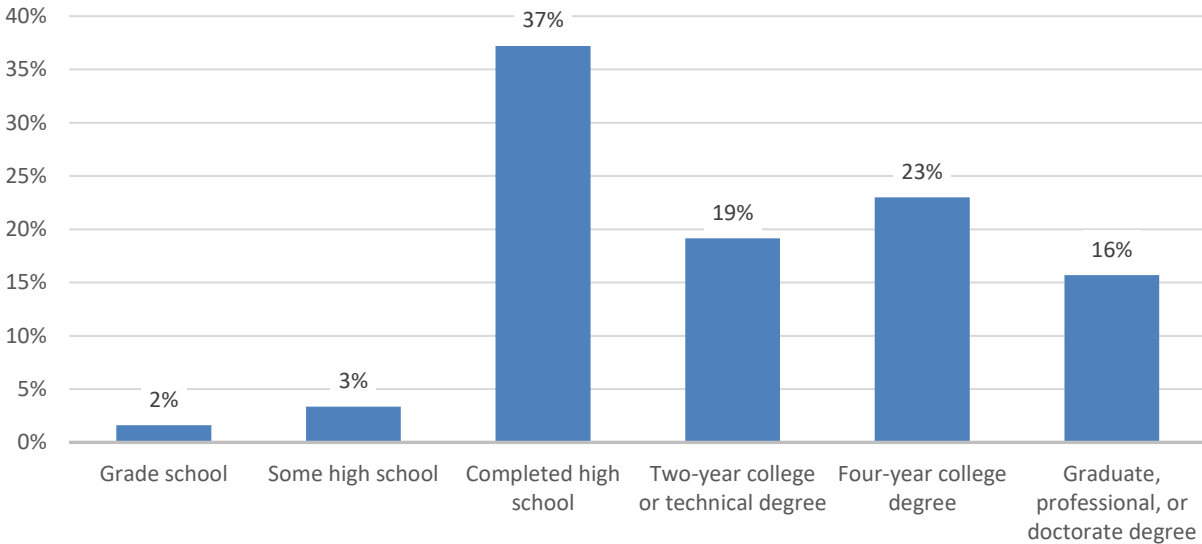
Survey data were weighted to correspond to the income distribution in the population. Twenty-one percent of households earn under $25,000 per year, 26 percent earn $25,000 to $49,000, and 53 percent earn over $50,000 per year (see Figure 65).

Figure 65: Annual Household Income
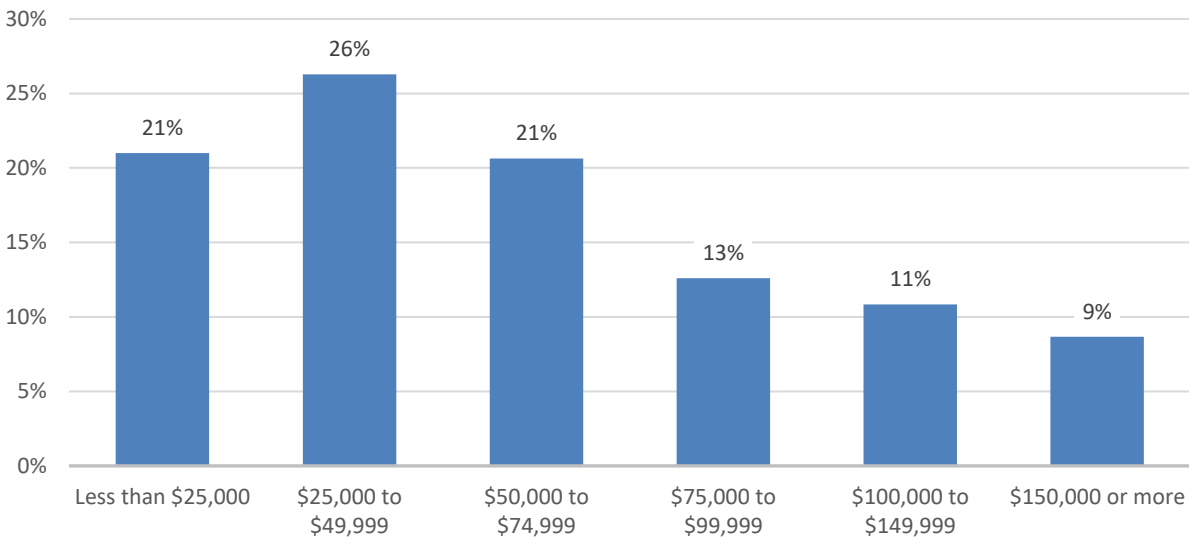
Respondents from lower-income households are more likely to have a high school education or less, have children in the household, and rent their home or live with family or another setting, as illustrated in Table 28. A larger proportion of those earning under $25,000 per year (60 percent) or $25,000 to $49,999 (65 percent) are Hispanic/Latino, compared with those earning $50,000 or more per year (39 percent).

Table 28: Demographic Profile by Household Income

Age Cohort	< 25,000	$25,000-$49,999	$50,000+	Total
Respondent Age				
< 35 years	37%	34%	35%	31%
35 to 44 years	18%	21%	21%	19%
45 to 54 years	17%	16%	15%	15%
55 to 64 years	13%	12%	16%	16%
65 years and older	15%	17%	13%	18%
Total	*90*	*113*	*230*	*504*
Education				
HS education or less	80%	64%	22%	42%
Two-year college or technical degree	7%	12%	26%	19%
Four-year college degree	5%	20%	29%	23%
Graduate, professional, or doctorate degree	7%	4%	22%	16%
Total	*91*	*115*	*230*	*508*
Race/Ethnicity				
Black/African American, non-Hispanic	13%	9%	10%	11%
Hispanic, Latino	60%	65%	39%	45%
White/European-American, non-Hispanic	19%	18%	44%	35%
Other/more than one	8%	8%	8%	9%
Total	*90*	*114*	*228*	*503*
Household Size				
One HH member	28%	21%	11%	18%
Two HH members	12%	21%	39%	32%
Three HH members	17%	20%	19%	18%
Four + HH members	43%	38%	32%	33%
Total	*86*	*115*	*229*	*498*
Children in Household				
No Children in HH	49%	57%	67%	65%
Children in HH	51%	43%	33%	35%
Total	*86*	*115*	*229*	*498*
Own/Rent Residence				
Own	26%	69%	75%	65%
Rent/live with family/other	74%	31%	25%	35%
Total	*90*	*115*	*230*	*508*

Survey data were weighted to correspond to the distribution of Hispanic/Latino individuals in the population. As illustrated in Figure 66, 38 percent of respondents are White/European American, and 12 percent are Black/African American.

Figure 66: Race/Ethnicity

Respondents could select more than one response, and figures may add to more than 100%.
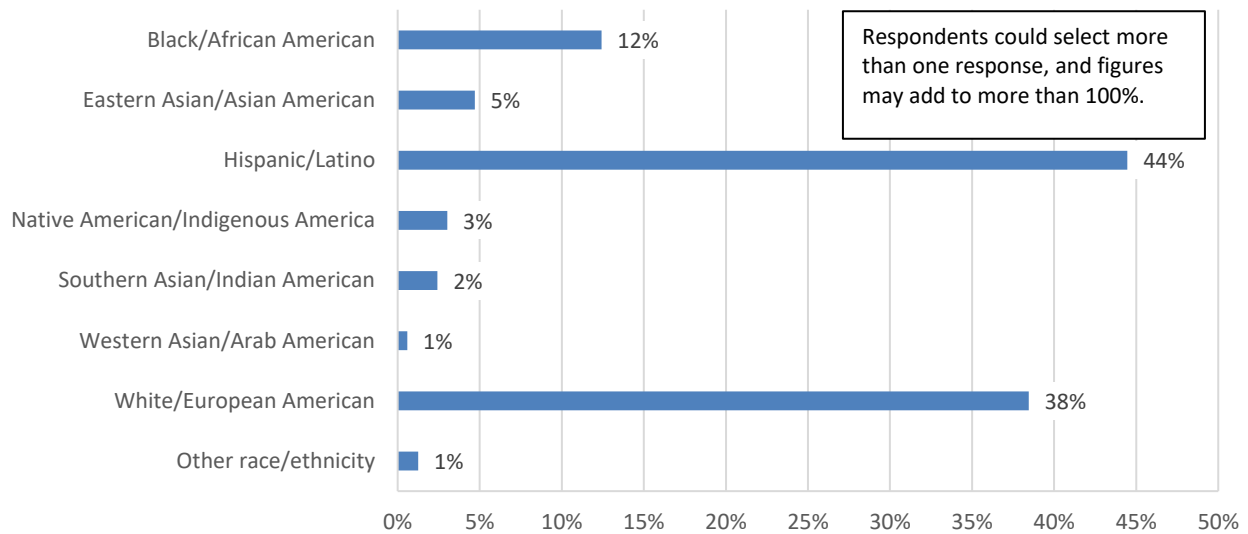
Respondents were asked to indicate the number of adults and children in their household. About one-half of households have two members, and 30 percent have three or more members. Just 21 percent of respondents live alone (see Figure 67). Thirty-six percent of respondents have children living in the household (see Figure 68).

Figure 67: Total Household Size
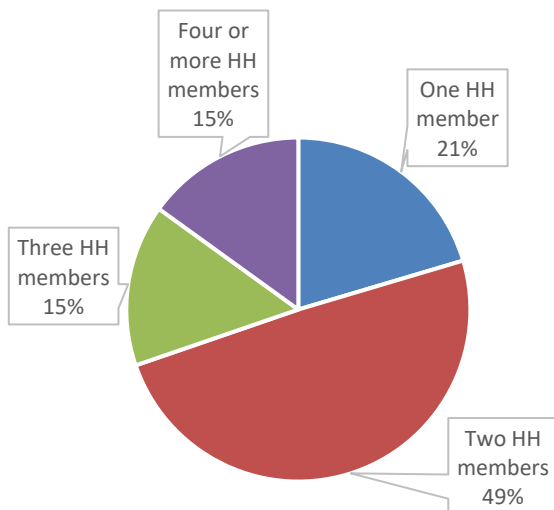
Figure 68: Number of Children in Household
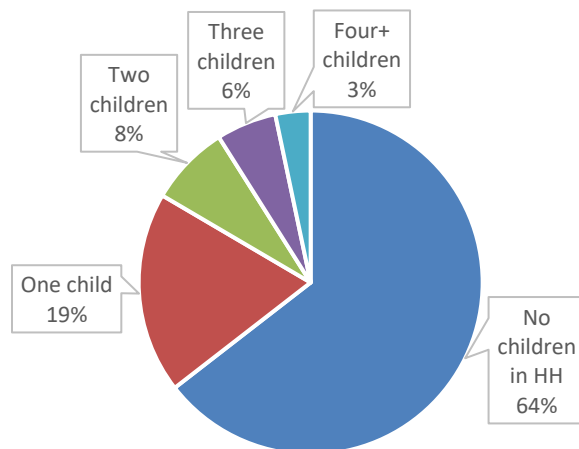
Most respondents (65 percent) own their residence, while 24 percent rent, 10 percent live with family, and 1 percent live in another setting (see Figure 69).

Figure 69: Own or Rent Residence
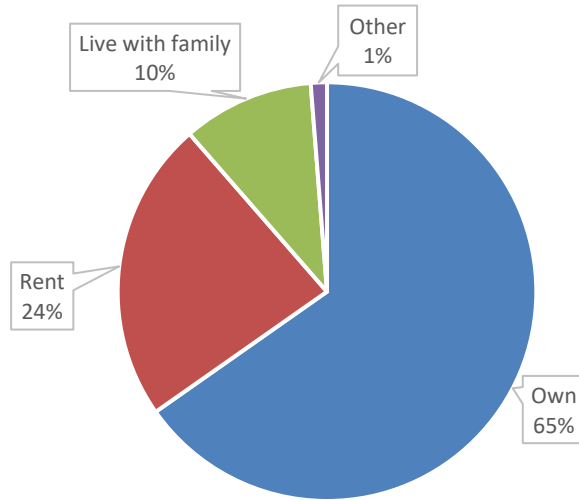
4 Engagement with Waukegan entities provide additional perspectives on gaps and existing programs—and make clear that significant expansion of programs is required to meet documented needs

To add local insights to complement survey data, CTC between September 2021 and January 2022 gathered information on gaps and programs. Methods included an information request sent to ConnectWaukegan members, engagement with ConnectWaukegan during meetings, and direct conversations with some stakeholders. Data gathered through this process suggest that, while Waukegan stakeholders do provide many devices and training programs, these efforts do not come close to meeting Waukegan residents' needs, especially students, seniors, the City's immigrant population—and low-income residents in general.

4.1 Overview of outreach and key issues identified

Through these combined efforts, CTC directly or indirectly made contact with the following entities:

- City of Waukegan

- Waukegan Community Unit School District #60

- Beacon Place Community Center

- Waukegan Public Library

- Waukegan Park District

- Mano a Mano Family Resource Center

- Schuler Scholar Program

- United Way of Lake County

- Lake County Health Department

- Cristo Rey St. Martin College Prep

- CYN Counseling Center

- Waukegan Main Street

- Hispanic American Community Education and Services (HACES)

- College of Lake County

- Urban Muslim Minority Alliance (UMMA)

- Boys and Girls Club of Lake County

- Waukegan Township Senior Center

- Lake County Workforce Development Office

Efforts to obtain a meeting, through the City, with the Waukegan Housing Authority were not successful.

The comments from Waukegan stakeholders converged on several key points on barriers that prevent Waukegan residents from making full use of the internet, including

- High internet subscription costs and difficulty enrolling in or lack of awareness of existing subsidy programs

- Trouble affording and maintaining a personal computing device

- Inadequate computer training programs to meet residents' demand

- Lack of a technical support, including to free devices provided by Comp-U-Dopt

Stakeholders and ConnectWaukegan members also frequently cited the challenges faced by undocumented immigrants living in Waukegan. Stakeholders relayed that many of these residents are wary of providing personal information necessary for signing up internet subsidy programs.

Several others also said they believed local commercial broadband infrastructure was inadequate to meet bandwidth needs, which our market research showed to be a misconception, at least in the City of Waukegan with respect to Comcast.

Waukegan stakeholders also described specific challenges faced by students in Waukegan. School-aged children in particular benefit from WCUSD's one-to-one device program that ensures every student enrolled in a Waukegan public school is given a Chromebook. But students must return the Chromebooks after graduation. ConnectWaukegan members cited concern over young adults' access to personal computing devices after graduating.

4.2 Waukegan stakeholders provide valuable computer training, device programs, and hotspots to Waukegan residents, but at a scale that falls short of the documented need

Some Waukegan stakeholders offer computer training programs, device lending programs and giveaways, and hotspot distribution programs to Waukegan residents—notably the WCUSD's 1+1 Chromebook program and extensive hotspot provision. Taken together, though, programs offered by Waukegan entities fall far short of meeting Waukegan residents' needs as stated by stakeholders and reflected in the survey data.

4.2.1 Waukegan Community Unit School District #60 provides every student with a personal computing device and provides hotspots

The WCUSD has made significant efforts to ensure their students have devices and internet access required for academic success. WCUSD has successfully implemented a one-to-one Chromebook-to-student program. To address the challenges Waukegan families faced when schools transitioned to virtual instruction during the COVID-19 Pandemic, WCUSD began extending schools' Wi-Fi footprint to cover school parking lots. Using the extended Wi-Fi signal, students who lack internet at home could complete homework assignments from school parking lots. WCUSD also provides and covers the subscription costs for approximately 2,000 T-Mobile hotpots. However, the hotspot program is costly, as the total yearly subscription costs WCUSD covers for Waukegan students is more than $400,000. And stakeholders expressed concern over students' access to personal computing devices after graduating from the school system and the high cost of maintaining students' hotspot subscriptions.

The WCUSD also offers computer classes for adults in partnership with the College of Lake County.

4.2.2 Waukegan Public Library offers valuable computer training, hotspot rentals, and device raffles and is well positioned for programmatic expansion if funds were available

The Waukegan Public Library has made significant efforts to ensure their Waukegan residents have the devices, internet, and computer skills. WPL currently offers a hotspot rental program, refurbished device raffles, and computer trainings for a variety of skill levels. But the potential demand for such services, as revealed by the survey data, far exceeds what the library currently offers. Significant expansion of library offerings could be a focus of future programmatic expansions and funding requests.

In 2021 the library implemented a pilot hotspot rental program. By the end of 2021, the library had 300 devices available, but only rents them for one week at a time, with renewal allowances dependent on the length of the waitlist. The library has held raffles where residents can enter to win a refurbished computer, and, so far, has provided 200 refurbished computers. The library hopes to acquire more computers for such giveaways.

The library also plans to introduce a "borrowing collection" of computers with hotspot. The library administers several successful computer training and assistance programs. Before the pandemic made in-person meetings less feasible, the library held six-week training courses that taught basic computer skills such as navigating the internet, accessing email, and using Microsoft Word. These courses were offered in both English and Spanish and served from 250 to 300 people every year. The library also held two-hour workshops during summers where participants learned about using Google Suite products.

The library also offered drop-in "lab" appointments for when residents needed one-on-one help with computers and programs. WPL reported that 75 percent of those who have completed their programs demonstrated improved computer skills.

The library transitioned to providing virtual computer training and guidance in response to the Pandemic. WPL staff offered limited classes in the virtual format and noted that these classes were only successful with individuals who already had basic computer skills. The library also offered virtual one-on-one help sessions and held an average of 30 appointments per week as of November of 2021.

In January 2022 the library was planning to transition back to in-person computer classes and tutoring sessions and a partnership was underway with two local school districts to offer computer classes to students' parents in Spanish. WPL also stated additional efforts targeting English-speaking student families were underway. WPL is also offering in-person classes at partner locations to ensure distance is not a barrier to Waukegan residents' participation in these trainings. The library has continued to offer virtual computer training and reported an increase in registration as of November of 2021.

Many participants reported to the library that they felt more confident in their ability to pursue new skills and advance their education after completing the trainings. Participants typically move on to the library's advanced computer skills courses after completing the basic trainings.

This success and interest suggest many more Waukegan residents would make use of WPL programs—or of similar programs offered by other entities—if funds were available to expand such programs.

4.2.3 College of Lake County's Waukegan campus offers computer training classes, is straining under the cost of hotspot loaners, and could serve as a center for expanded programmatic efforts and connectivity in Waukegan

The College of Lake County (CLC) is another key stakeholder offering digital skills training to Waukegan residents and could serve as a site for expanded efforts. CLC's primary campus is located in Grayslake but is now in the midst of a redevelopment of its Waukegan satellite campus, called the College of Lake County, Lakefront Campus (CLC LC). This project is a significant new focus of downtown development.

CLC offered computer classes across Waukegan through partnerships with local non-profits, while CLC LC provides hotspots for many students. However, it is unclear whether CLC's training courses will resume after the pandemic subsides. It also remains unclear whether CLC LC will be able to cover the cost of students' hotspot subscriptions in the future.

Before the pandemic, CLC offered digital skills training at school sites in Waukegan and the nearby communities of Round Lake and Beach Park. CLC also offered computer training at other Waukegan stakeholder sites like Beacon Place, a Hispanic American Community Education Services (HACES) facility, the Salvation Army, Mano a Mano, and the Young Women's Christian Association (YWCA) in addition to trainings offered at the CLC's Grayslake, Southlake, and Lakeshore campuses. According to ConnectWaukegan representatives, all computer courses offered by CLC are free. CLC's computer training is also embedded in the English as a Second Language (ESL) courses it offers.

As of late 2021, the CLC LC had distributed approximately 200 T-Mobile hotspots to its students and was covering the subscription costs. Many of the hotpots were purchased with a Workforce Equity Initiative Grant (WEI), a statewide grant program focused on expanding training opportunities for minority students in at-risk communities. The College has submitted a request to receive additional funding through this grant program.

4.2.4 Urban Muslim Minority Alliance (UMMA) offers computer training courses to Waukegan residents

The Urban Muslim Minority Alliance (UMMA) is a non-profit organization that provides low-income individuals opportunities for education and maintains a center in downtown Waukegan where it offers GED training courses, financial literacy seminars, a food pantry, and computer training courses. As part of their programming, UMMA offers computer training to Waukegan residents. Before the pandemic, UMMA offered two computer labs for courses. UMMA transitioned to virtual computer classes for a period of time but was returning to in-person instruction if participants demonstrate proof of vaccination. The UMMA is one of the many nonprofits having the potential to expand computer literacy and training programs to address the identified gaps in Waukegan.

4.2.5 United Way of Lake County has a significant device program in place through a partnership with Comp-U-Dopt, but cannot keep up with demand for devices and their maintenance

United Way maintains the largest device program in Waukegan, having distributed 450 refurbished computers through a partnership with Comp-U-Dopt, a device recycling nonprofit. ConnectWaukegan members have also mentioned other Comp-U-Dopt device giveaways in Waukegan, such as a 50-device give away that took place in early December 2021. ConnectWaukegan members involved with this device giveaway cited concern over the program did not have a device maintenance component.

4.2.6 A variety of other programs could be expanded to meet the significant needs in Waukegan if funds were available

Additional computer training and device programs or offerings are present in Waukegan and could serve as the seeds of future expansion.

- Comcast: Comcast's Internet Essentials programs includes options for purchasing a Dell computer for $149 and for skills training programs. A Comcast representative said he did not have Waukegan-only data on the uptake of these programs locally.

- Beacon Place: Beacon Place is a community center and nonprofit organization offering a variety of programs for children and families. Beacon Place has provided 25 hotspots and 50 personal computing devices to Waukegan residents and has also provided support for residents enrolling in low-cost internet programs. The leadership of Beacon Place is deeply involved in ConnectWaukegan's efforts and in understanding and closing broadband gaps in Waukegan.

- Lake County Workforce Development Office: Currently, the focus of this workforce development agency in Lake County is on developing the skills a potential employee needs to be successful in business. This organization is in a particularly strong position to expand its programs effectively and efficiently, were funding available.

- The Boys and Girls Club of Lake County operates a computer training platform called MyFuture. On the web-based MyFuture platform, children can interact with a variety of online activities in a safe, monitored environment. According to a ConnectWaukegan representative, the Boys and Girls club provides additional computer-based activities during their summer programming.

Table 29 summarizes hotspot distribution efforts made by all Waukegan stakeholders. Although this may be an incomplete list, it is safe to say that these and other device provision and maintenance programs in Waukegan appear to fall significantly short of the need.

Table 29: Hotspots (MiFis) Reportedly Provided by Waukegan Stakeholders

Stakeholder	Number of Hotpots provided
WCUSD #60	2000
Waukegan Public Library	300
College of Lake County, Lakeshore Campus	200
Beacon Place Community Center	25
Mano a Mano Family Resource Center	2
Schuler Scholar Program	15
Totals	**2542**

Several organizations said they were providing Chromebooks or laptops to residents in Waukegan. Table 30 outlines these organizations and the devices each reported providing. This is a snapshot that may miss some efforts, such as through Comcast's $149 laptop program (for which data is not available). But numbers suggest large gaps and significant opportunities for programmatic expansion.[20]

Table 30: Laptops or Refurbished Computers Reportedly Provided by Waukegan stakeholders

Stakeholder	Number of laptops or Chromebooks provided
WCUSD #60	Update number
United Way of Lake County	450
College of Lake County, Lakeshore Campus	300
Waukegan Public Library	200
Beacon Place Community Center	50
Schuler Scholar Program	30
Mano a Mano Family Resource Center	25
Total	

4.2.7 Stakeholders voice urgent need for funds, technical support, and expanded device and skills programs

Andrew Park, director of IT at Cristo Rey St. Martin College Prep:

Some students on Waukegan have internet connection problems and low capacity of bandwidth, so they had hard time conducting proficiency assessments in May 2021. They will have issues in working on homework at home. They may need to visit library or stay school late. Most of parents are busy and don't have time to stay at the library parking lot or inside of the library. ***"We would like to provide MiFis to those families, but how do we get the funds?"***

Joshua Fulcher, executive director at Beacon Place:

"Ongoing support is the most difficult. Chrome books and MiFis can break. Tracking everything is difficult. I think easy access to a new Chromebook- when one breaks- is very important. ***We need a low hassle process.****"*

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[20] In the case of Beacon Place, Mano a Mano and the Schuler Scholar Program, the number of households whose monthly internet bill the organizations covered by each organization was limited to only a few households.

Celeste Flores, director of community building at Mano a Mano Family Resource Center:

*A significant barrier is the cost of internet and families lacking a laptop or computer at home. **Many families rely on a student's Chromebook for basic needs.** People were cut off from device and connectivity when libraries closed during the pandemic.*

Lindsay Vozar, the Schuler Scholar Program, a college prep program for low-income students:

*Many families "do not understand the value or importance of home internet" and instead accept the inadequate bandwidth of their phones. She also cited device insecurity and pointed to a big need for technical support for issues such as lost power cords. **"The internet needs to be viewed as a 'school supply' for families with students of all levels."***

*She said students and parents generally do not access school information online. **Facebook from the district is the source of information in many ways, but the platform doesn't serve people who are disconnected.** One of our strategic goals for the future of Schuler is to increase family engagement through parent workshops and family mentoring. We know we can reach more people if we can do it electronically – but they need reliable internet at home."*

Thomas Maillard, director of government operations, City of Waukegan:

*"**Every day, the internet and digital literacy become more and more critical.** Any members of our communities unable to access the internet or navigate internet-connected technologies are at an undeniable disadvantage in their prospects for long-term education, health, and financial wellbeing. We must all urgently act to prevent these life-threatening disparities."*

5 Subsidy programs could many economically vulnerable Waukegan residents, especially through the ACP, but signup facilitation and broader use of available partner programs is needed

The ACP is the single largest program to facilitate signups by low-income residents. Comcast is the logical partner to maximize participation. The company's representative made clear the company is ready to assist in enrollment and promotional activities. To a lesser extent, AT&T, where fast service is available, also represents a viable option for ACP signups. Both companies also shared other ways in which they could serve as partners for enrollments, bulk purchase arrangements and, in the case of Comcast, device and skills programs.

We drafted requests and facilitated other communications between Waukegan and incumbents' representatives to discuss how to increase outreach to eligible families to facilitate enrollment in the ACP and the existing programs from Comcast's Internet Essentials and Access from AT&T. As we learned in our research and from talking to the providers that, faced with this choice, Comcast is the more viable partner based on its ubiquity and its willingness to be a partner.

We also engaged with E-Vergent to determine whether they were assisting any of their customers and gathered information from Comcast about its past offers and future willingness to engage more broadly in efforts to close digital equity gaps in Waukegan. The goal of these outreach efforts was to provide ConnectWaukegan an understanding of the types of ways it can engage with local ISPs to address broadband gaps in Waukegan.

This section details the results of our research and engagement.

5.1 The Affordable Connectivity Program (ACP) represents the single largest option for Waukegan to increase connections for low-income residents

The Infrastructure Investment and Jobs Act, which became law on November 15, 2021, will provide more than $14 billion to a revised program at the Federal Communications Commission that subsidized broadband services for low-income household.[21] A component of this funding will go towards supporting a permanent version of the Emergency Broadband Benefit Program ("EBB"). Like the EBB, this new program, dubbed the Affordable Connectivity Program, will reimburse providers a fixed amount for providing service to qualifying households. Broadband providers can receive up to $30 per month for providing service to low-income households (down from $50 under the EBB); the discount is passed on to the subscriber.[22]

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[21] *In the Matter of Affordable Connectivity Program, Emergency Broadband Benefit Program*, WC Dockets N. 21-40, 20-445. FCC. https://www.fcc.gov/document/fcc-releases-rules-implement-affordable-connectivity-program (accessed 10 Jan 2022).
[22] Ibid.

Rental fees for broadband-enabling equipment (such as a modem) are eligible for the subsidy. Other services (texting, phone) may be subsidized if part of a bundle that includes qualifying broadband service.[23]

Additionally, the FCC will also reimburse providers up to $100 for subscribers purchasing a connected device from the provider. Eligible devices are laptop, desktop, or tablet computers. The consumer or household must be charged no less than $10 and no more than $50 for this device.[24]

Eligible households are expanded from the original qualification criteria set fourth for EBB. A household is considered eligible if they meet one of the following criteria:

- The [household/individual] qualifies for the FCC's existing Lifeline Program;

- The household's income is at or below 200 percent of the Federal Poverty Guidelines (the Emergency Broadband Benefit program's eligibility was set at 135 percent);

- At least one person in the household must receive benefits from one of the following federal assistance programs: Medicaid, Supplemental Nutrition Assistance Program, Supplemental Security Income, Federal Public Housing Assistance, or Veterans and Survivors Pension Benefit;

- At least one person in the household is in the free and reduced-price lunch program or the school breakfast program (including the Community Eligibility Provision);

- At least one person in the household has received a Federal Pell Grant in the current award year; or

- At least one person in the household is eligible to participate in their broadband provider's existing low-income.

As with the EBB, the burden will be on households/customers to prove their eligibility. They will have to apply through the National Lifeline Verifier portal.

Note, however, that current Lifeline participants will not be required to submit additional documentation. They will instead have the opportunity to request enrollment in the Affordable Connectivity program if their current provider participates.[25]

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[23] Ibid.
[24] Ibid.
[25] Benton, Ibid.

5.2 Comcast expressed willingness to facilitate Internet Essentials signups, classes, and establish free Wi-Fi in community centers

Internet Essentials is difficult for individuals to navigate. Comcast also offers Internet Essential Partner Programs (IEPP) through which institutions can sponsor service for groups of subscribers.

However, "sponsoring" may be less the operative word than facilitating signups to free service through the ACP. The ACP's $30 monthly subsidy means this basic service would be free. With that said, it is important to note that Comcast will offer customers additional services (such as video services) for which those customers would have to pay. Our recommendations on how ConnectWaukegan can scale signup assistance is found in Section 1.2.

Internet Essentials also provides access to purchase a new Dell computer (laptop or notebook) at $149.99, and written, on-line, and classroom training, but the Comcast representative said no Waukegan-specific data was available about update of any of these programs. (However, he did say that over the 10-year existence of the low-cost program, Waukegan has added 3,000 connections, or about 300 per year.)

If local organizations are conducting classes, a Comcast representative indicated that Comcast would be interested in speaking to them to scale the effort; any interested organizations can call (855) 846-8376. The company also encourages community organizations to register on the website ([www.InternetEssentials.com)](www.InternetEssentials.com) to access training materials and receive updates.

Comcast says it has discussed with the Waukegan Housing Authority the potential for bulk purchases in WHA units. In any case, the company currently has service in all WHA buildings and has a Community Account Representative who works with the building managers. CTC's efforts through the City to obtain a meeting with the WHA to discuss tenant needs and whether they were fully enrolled was unsuccessful. For ConnectWaukegan's reference, a Comcast Internet Essentials partnership draft agreement CTC obtained from another jurisdiction is provided in Appendix D

5.2.1 Comcast says it promotes Internet Essentials and training programs in the community, but enrollment support is likely needed

To promote Internet Essentials and assist in training efforts, Comcast says it has partnered with:

- United Way of Lake County to sponsor the Kindergarten Readiness Calendar which is sent to over 15,000 Lake County families (with children entering school) each year to promote IE availability; and 211 Lake County which serves all 700,000 county residents to provide IE info for cases inquiring about connectivity.

- Boys & Girls Club of Lake County to sponsor their programs which provide computer and internet training and promotes Internet Essentials for home use.

- Mano a Mano Family Resource Center to sponsor their digital literacy training program and promote Internet Essentials for home use.

- Lake County Partners, to not only to ensure that businesses have the latest Internet info, but also to promote Internet Essentials for home educational use.

- Lake County Municipal League to not only provide the latest info to local governments, but to ensure they have the Internet Essentials information.

He also indicated that as part of the company's March 2021 Covid response, all Comcast exterior Wi-Fi hotspots remain open for free for use by anyone, including all 98 in Waukegan.

5.2.2 Comcast offers to provide Wi-Fi in rooms of community-based organizations, but the service may not be useful in practice

Comcast also offers to provide free Wi-Fi in community center rooms of around 1,000 square feet under a program called Lift Zones. In practice, however, it is not clear how useful the Comcast offer is, given that all entities to which Comcast made the offer in Waukegan already had Wi-Fi.

5.3 AT&T offers a bulk purchase option that would bring fiber to apartment buildings, which could be an attractive option in some circumstances

As noted above, AT&T's service is spotty in Waukegan. However, in response to our engagement, AT&T responded to say they are willing to engage in fiber buildouts to apartment buildings in a bulk-buy scenario. This is a potentially attractive option, particularly because, unlike Comcast's cable service, the AT&T fiber service would be "symmetrical" (i.e., providing the same speeds for upload and download).

The company says the apartment building or complex would need to have 50 or more units and a single entity willing to buy service in bulk for all units. AT&T will then explore whether it is feasible to build fiber service to the building. The company will conduct a review, which may include a site survey of the properties by AT&T's engineering team. The information needed would be the following:

- Property name
- Property address
- Point of contact for the property
- Address list of the property
- Total units
- Number of buildings in the property
- Number of floors and units per floor

AT&T would then offer symmetrical (same speed download and upload) at the following prices for three speed offerings, at a significant discount from retail prices. At the lowest offered price, AT&T would charge $21 per customer for 100 Mbps symmetrical service if the bulk-buy agreement stretched for 10 years. The pricing is for high-speed internet access (HSIA) not phone or video services. The full range of prices and speeds for AT&T's bulk fiber purchasing arrangement is provided in Table 31.

Table 31: AT&T Pricing for Bulk Purchases of Symmetrical Fiber Service

Internet Service Speeds	Retail Price	Bulk Pricing for Internet Service Only		
		(5-year term)	(7-year term)	(10-year term)
100 Mbps	$60	$25	$23	$21
300 Mbps	$80	$32	$30	$28
1000 Mbps	$100	$40	$38	$36

The program comes with additional terms and conditions and would be subject to a negotiation. But at a high level this could represent a viable option for any apartment buildings in Waukegan where a bulk-buyer is willing to step in. This would also be a potentially attractive program for a property owner who is willing to add this amenity and can build the fee into the rents.

5.4 E-Vergent is not facilitating enrollments in the ACP because of the cumbersome process, but might do so if it had technical assistance

E-Vergent said that it had few customers who were seeking the lower-cost services under EBB or ACP because few of them were low-income. In the few cases where the assistance was sought, E-Vergent elected to simply give them a discount without going through the cumbersome application process. If E-Vergent is ever a serious player in Waukegan—which fixed wires companies are in other cities—we recommend that ConnectWaukegan or its members assist the company in navigating the process so that low-income residents can participate in the ACP using E-Vergent.

6   Significant new funding sources may allow for expansion or creation of digital equity initiatives in Waukegan

Significant new funding sources have recently been authorized that will expand the opportunities to create meaningful programs to expand digital access and equity for communities across the country. These programs will develop at both the federal and state levels and be the subject of significant rulemaking processes for design and implementation, making 2022 an important year for Waukegan entities to prepare for new funding and program opportunities. For example, the Treasury Department just released rules regarding the framework and requirements for spending the Coronavirus Capital Projects Fund and the Coronavirus State and Local Fiscal Recovery Fund, and the NTIA is currently taking public comments on the rules to implement key broadband deployment and equity pieces of the Infrastructure Investment and Jobs Act (IIJA).

As discussed above, the FCC just launched the $14 billion ACP to support affordable data services to eligible households for either wireless or wireline services. The most significant funding opportunities are discussed in more detail below.

6.1   Infrastructure Investment and Jobs Act

The $1 trillion Infrastructure Investment and Jobs Act (IIJA)—including $65 billion in broadband funding for extensive deployment and digital equity initiatives—was signed into law on November 15, 2021. The NTIA is directed by Congress to implement programs that will consist of $48.2 billion of the IIJA broadband funds and the Agency is currently in the process of taking public comment and drafting rules for implementation of several of the programs. NTIA is charged with issuing rules for the broadband deployment funding by May 14, 2022, which will set guidelines for the application process.[26]

As part of this process, NTIA is directed to use federal broadband deployment maps, which are still in development, to determine the allocation of broadband deployment funding to the states. Once that money is distributed, states are directed to develop a comprehensive set of grant programs to further distribute the money to benefit communities throughout the state. Applications for the Digital Equity Planning program included in the IIJA won't be available until October of 2022, yet the Act sets out significant prerequisites for the states to apply for this funding that mean some states will be begin getting public input on digital equity throughout the year.

There is still much work to be done and possible opportunities to open a dialogue with Illinois state officials and the Broadband Office about their plans to accept the federal funding and move

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[26] NTIA issued a Request for Comment on January 10, 2022, regarding the broadband deployment funding program, the digital equity planning grant program, and the middle mile grant program. Notices for comment on additional digital equity and Tribal programs will be forthcoming. https://www.ntia.gov/files/ntia/publications/iija_broadband_rfc.pdf (accessed January 27, 2022).

forward with projects. The IIJA places a strong emphasis on community outreach and engagement at several steps in the funding and program process for both broadband deployment and digital equity. Over the coming months, the agencies responsible for administering the funds at the federal and state level may release more requests for comments; develop frameworks and rules; and issue notices of funding opportunities—including for the kinds of programs that could address gaps in Waukegan. The Office of Broadband publishes an Illinois Broadband Community newsletter. [27] This is a great resource to consult during a time of unprecedented broadband opportunities. It is likely that most decisions related to program design and eligible projects will be delegated by the federal agencies down to the state level for further distribution to local agencies, communities, and service providers.

The NTIA will administer $48.2 billion of the broadband funding through the following programs:[28]

1. *Broadband Equity, Access, and Deployment (BEAD) Program:* $42.45 billion "for broadband deployment, mapping, and adoption projects"

2. *Digital Equity Act Programs:* $2.75 billion "for grant programs that promote digital inclusion and equity to ensure that all individuals and communities have the skills, technology, and capacity needed to reap the full benefits of our digital economy"

3. *Tribal Broadband Connectivity Program:* $2 billion

4. *Enabling Middle Mile Broadband Infrastructure Program:* $1 billion "for the construction, improvement or acquisition of middle mile infrastructure"

Of these, BEAD and the digital equity programs represent opportunities for securing funding—based on the local prioritization and, potentially, a successful grant application to the competitive element of the digital equity program. (The ACP is also part of the IIJA, providing $14 billion in subsidies that likely will go directly to low-income broadband subscribers.)

6.1.1 Broadband Equity, Access, and Deployment (BEAD) Program

Illinois will receive a minimum of $100 million in BEAD funding—representing the initial minimum distribution to each state.[29] Additional allocations will be distributed based on a state's unserved and high-cost areas.

NTIA reports that "the first priority for funding is for providing broadband to unserved areas (those below 25/3 Mbps), followed by underserved areas (those below 100/20 Mbps), and then

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[27] https://cdn.forms-content.sg-form.com/ed480a4f-93b1-11ea-a3bd-6e44b5c3a639
[28] "Grants," NTIA, https://ntia.gov/category/grants (accessed November 17, 2021).
[29] "The Broadband Equity, Access & Deployment Program (BEAD): $42.45 Billion for State Broadband Grants," National Law Review, $45.45 Billion for State Broadband Grants (natlawreview.com) (accessed December 6th, 2021).

serving community anchor institutions (1/1 Gbps)."[30] Funding will be sent to states who will then make sub-grants. A subgrantee that receives funding to deploy a network will be required to ensure the networks capable of delivering at least 100/20 Mbps service within four years of the date of the subgrant—and to offer a low-cost service for low-income subscribers.[31]

While Waukegan would not qualify as an "unserved" or "underserved" eligible area for deployment funding given the existence of gigabit service from Comcast, the law also provides for other applications for BEAD grants that will be further developed by NTIA. The statute allows funding to be used for broadband planning (up to 5 percent of funding), connecting community anchor institutions without access to Gigabit service, supporting broadband adoption efforts, and constructing infrastructure to serve low-income families in multi-dwelling buildings. [32] ConnectWaukegan should monitor the development of these additional opportunities for funding to determine if entities within Waukegan will qualify.

After the NTIA releases its rules in May, the next step will be the allocation of funding to the states and several yet-to-be-finalized dates for states to submit a series of planning documents and applications. Due to the complexity of this process, and the reliance on FCC's new broadband mapping process to identify "eligible areas" for funding, it is unlikely that any funding will be available to local entities prior to the fourth quarter of 2022. Yet, it is likely that federal, state and local agencies will spend significant resources throughout this year to plan for these projects, including work to solicit local community input and engagement. We recommend that ConnectWaukegan monitor this process and plan to participate, as well as coordinate community efforts for participation, to communicate the needs in the area and potential solutions.

6.1.2 State Digital Equity Planning Grant Program

NTIA's digital equity program comprises three elements:

1. State Digital Equity Planning Grant Program ($60 million)

2. State Digital Equity Capacity Grant Program ($1.44 billion)

3. Digital Equity Competitive Grant Program ($1.25 billion)

NTIA has stated that these programs aim "to promote the meaningful adoption and use of broadband services across the targeted populations in the Act, including low-income households, aging populations, incarcerated individuals, veterans, individuals with disabilities, individuals with a language barrier, racial and ethnic minorities, and rural inhabitants."[33]

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[30] "Grants," NTIA, https://ntia.gov/category/grants (accessed November 17, 2021).

[31] IIJA, p. 771, https://www.congress.gov/bill/117th-congress/house-bill/3684 (accessed November 17, 2021).

[32] IIJA, p. 767, https://www.congress.gov/bill/117th-congress/house-bill/3684 (accessed November 17, 2021).

[33] "Grants," NTIA, https://ntia.gov/category/grants (accessed November 17, 2021).

The State Digital Equity Planning Grant Program provides funding directed toward state broadband offices to develop digital equity plans, with required local stakeholder engagement and input. These plans serve as the framework for each state's digital equity projects that can be funded through the State Digital Equity Capacity Grant Program. The State Digital Equity Capacity Grant funding will be distributed in annual grants to each state over five years "to implement digital equity projects and support the implementation of digital equity plans."[34] States are directed to use this money to establish programs to fund both statewide and local digital equity efforts. The Digital Equity Competitive Grant Program differs from the other two programs because it allows for grants from the NTIA directly to local agencies, and other community organizations such as nonprofits, anchor institutions including schools, Tribal entities, and workforce programs.

Current and anticipated efforts in Waukegan to address digital equity issues may qualify for funding under these federal digital equity programs, but more clarity and guidance will come in the coming months as NTIA issues rules and guidance for these programs, most likely in the fall. Similar to the efforts described for the BEAD program, ConnectWaukegan should remain vigilant to information about the development of these programs and opportunity for public input and collaboration with key community partners.

6.1.3   Tribal Broadband Connectivity Program: $2 billion

Though not applicable to Waukegan, the NTIA has allocated an additional $2 billion to the Tribal Broadband Connectivity Program, which already had a first round of grant applications closing on September 1, 2021. There were no substantial changes to the rules of the program. The updates include an allowance to fully fund applications from the first round that may not have been funded and allowed for 2.5 percent of broadband requests to be allocated toward "of the total project cost for planning, feasibility, and sustainability studies related to the project."

6.1.4   Enabling Middle Mile Broadband Infrastructure Program: $1 billion "for the construction, improvement or acquisition of middle mile infrastructure"

The NTIA will also oversee a new direct grant program related to middle mile infrastructure expansion—but we do not anticipate that this will be available in urban areas with extensive cable coverage, like Waukegan. The Middle Mile Infrastructure Program (MMBIP) is a means of maximizing the ability of eligible entities to enter into creative partnerships with providers or entities that have the ability to provide last mile solutions but may lack the incentive to build the backbone necessary to serve hard-to-reach rural areas.

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[34] BroadbandUSA, "NTIA's Role in Implementing the Broadband Provisions of the 2021 Infrastructure Investment and Jobs Act," NTIA, https://broadbandusa.ntia.doc.gov/news/latest-news/ntias-role-implementing-broadband-provisions-2021-infrastructure-investment-and (accessed November 17, 2021).

6.2 The $14 billion Affordable Connectivity Program will subsidize broadband bills for eligible low-income subscribers

As noted in greater detail above, another part of the IIJA is an allocation of $14.2 billion for an Affordable Connectivity Program (ACP) to be administered by the FCC. The FCC just released its rules for the ACP on January 21, 2022.[35] This program will replace the Emergency Broadband Benefit and will provide $30 monthly subsidy toward a broadband subscription to eligible low-income residents. The ACP will also subsidize the cost of a "connected device" up to $100, including laptops, desktops and tablets, but not cell phones or tablets with cellular service capabilities.[36] The ACP has broad eligibility criteria allowing households at 200% of poverty or those participating in a wide variety of federal subsidy programs to qualify for these benefits.

While the ACP has significant potential to support access to robust residential broadband service for low-income households, the success of the ACP will hinge on the smooth implementation of the rules, the ease of the enrollment process, and support by the ISPs that will not only be a significant part of the enrollment process but also be legally obligated to inform customers about the ACP. Congress allowed money appropriate to the ACP to be used for outreach and education purposes. FCC has expressed strong support for the need for robust outreach and has developed outreach materials and created an "outreach partner" program that may also including paid outreach efforts, to try to increase participation rates for this important program. The FCC is taking further comments on this issue and will consider design and structure to fund local community outreach efforts. [37] As discussed below, community connectors like ConnectWaukegan can take a leadership role to develop and support enrollment efforts throughout Waukegan and the surrounding community. We recommend that ConnectWaukegan closely monitor the development of the ACP outreach grant process and work with community members to support this program.

6.3 Illinois will receive $254 million through the Coronavirus Capital Projects Fund

The Treasury's Coronavirus Capital Projects Fund (CPF) is a $10 billion program authorized under the American Rescue Plan Act of 2021 that will provide flexible funding opportunities for a wide range of broadband-related projects to be administered at the state level. The program will allow funds to be use for costs that fit into one of three major categories:

1. Broadband Infrastructure Projects: "[C]onstruction and deployment of broadband infrastructure designed to deliver service that reliably meets or exceeds symmetrical

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[35] In the Matter of Affordable Connectivity Program WD Docket 21-450, Report and Order and FNPRM (FCC 22-2) (Rel. January 21, 2022) (ACP Final Rules), https://docs.fcc.gov/public/attachments/FCC-22-2A1.pdf (accessed January 27, 2022)

[36] ACP Final Rules at paras 92-118.

[37] ACP Final Rules at paras 190-195, FNPRM at 271-280.

speeds of 100 Mbps so that communities have future-proof infrastructure to serve their long-term needs."

2. Digital Connectivity Technology Projects: "[P]urchase or installation of devices and equipment, such as laptops, tablets, desktop personal computers, and public Wi-Fi equipment, to facilitate broadband internet access for communities where affordability is a barrier to broadband adoption and use." Those who can't afford to pay for services, even if available, are considered unserved.

3. Multi-Purpose Community Facility Projects: "[C]onstruction or improvement of buildings designed to jointly and directly enable work, education, and health monitoring located in communities with critical need for the project."

Illinois will receive $254 million and the state has until September 24, 2022, to submit a formal grant plan describing how the state's allocation will be used.[38]

6.3.1 Coronavirus State and Local Fiscal Recovery Fund

The U.S. Treasury has released final rules for the Coronavirus State and Local Fiscal Recovery Funds program.[39] Established by the American Rescue Plan Act (ARPA), this program will distribute $350 billion in emergency funding to eligible state, local, territorial, and Tribal governments.

Congress created this program with no limitations on how it could be spent to expand access to high-speed broadband services. Treasury has since clarified that these funds can be used for broadband deployments and digital inclusion strategies designed to facilitate connectivity in areas without access to reliable service at speeds of 100/20 Mbps, but can also be broadly invested, "in projects designed to provide service to locations with an identified need for additional broadband investment."[40] The Treasury further notes that recipient of grant funding have the flexibility to identify these needs tailored to the community that will be served by the project.[41]

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[38] Guidance Document for CPF for States (September 2021) https://home.treasury.gov/system/files/136/Capital-Projects-Fund-Guidance-States-Territories-and-Freely-Associated-States.pdf; See, also, Frequently Asked Questions, Capital Projects Fund. Dept. of the Treasury (updated January 4, 2022), https://home.treasury.gov/system/files/136/Coronavirus-Capital-Projects-Fund-FAQs_FINAL.pdf (accessed January 27, 2022).
[39] 31 CFR Part 35 (Pandemic Relief Programs), effective April 1, 2022, https://home.treasury.gov/system/files/136/SLFRF-Final-Rule.pdf (accessed January 27, 2022); See also, Overview of the Final Rule (January 2022), https://home.treasury.gov/system/files/136/SLFRF-Final-Rule-Overview.pdf.
[40] Treasury Overview of the Final Rule at p. 39.
[41] 31 CFR Part 35 Section 35.6 (e)(2)(A), see also discussion at page 306; See also Treasury Overview of the Final Rule at pp. 7, 39.

Treasury's final rules establish minimum requirements on how recipients can use funds for broadband deployments;[42] the rules also provide guidance about the range of digital inclusion projects that can use program funds.[43] Key guidance includes the following:

- **Infrastructure projects must support 100 Mbps symmetrical speeds unless geographical, topographical, or fiscal constraints make it impractical.** For the purposes of the Fiscal Recovery Funds, Treasury's approach to broadband infrastructure matches some of the most forward-thinking states' broadband grant programs. In its final rules, Treasury expects the funds to be used on broadband deployments that are capable of at least 100/100 Mbps speeds to address Americans' modern communications needs. The program also strongly suggests that projects focus on fiber deployments, because fiber has the capability of affordably meeting the steady annual increase in broadband capacity demands faced by our nation's networks.

  The final rules also outline a scenario in which symmetrical 100 Mbps service may be considered "not practicable, because of the excessive cost of the project or geography or topography of the area to be served by the project,"[44] and in that case, require projects to provide 100/20 Mbps service with the ability to scale to 100 Mbps symmetrical. This appears to be a concession to incumbent cable providers who can cost-effectively extend to unserved locations from their current network footprint and are on a roadmap to symmetric speeds. Most cable companies have implemented DOCSIS 3.1—and while they currently limit upstream to 35 to 50 Mbps, field upgrades would allow them to deliver gigabit speeds upstream and would also put them on a long-term roadmap to DOCSIS 4.0's 10/6 Gbps capability.

- **Projects should address areas that lack 100/20 Mbps.** The final rules state that recipients are encouraged to prioritize projects that address unserved and underserved areas, defined as those that do not yet have access to speeds of at least 100/20 Mbps.[45] The manner in which this goal is phrased suggests wide latitude in designing projects—with preference for locating investment in unserved locations.

- **Projects are encouraged to prioritize affordability as well as local broadband solutions.** After noting that the U.S. has some of the most expensive broadband service in the world,[46] the program's final rules place special emphasis on ensuring that the resulting

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[42] 31 CFR Part 35 Section 35.6(e)(2)(i)(B); See also Treasury Overview of the Final Rule at p. 39.
[43] 31 CFR Part 35 Section 35.6(e)(2)(C); See also Treasury Overview of the Final Rule at pp. 39-40.
[44] 31 CFR Part 35 Section 35.6(e)(2)(i)(B); See also Treasury Overview of the Final Rule at p. 39.
[45] 31 CFR Part 35, Supplementary Information at p. 296; Treasury Overview of the Final Rule at p. 39.
[46] "Even in areas where broadband infrastructure exists, broadband access may be out of reach for millions of Americans because it is unaffordable, as the United States has some of the highest broadband prices in the

broadband service provided over the funded network is affordable. The Treasury encourages broadband services to also include at least one low-cost option offered without data usage caps at speeds sufficient for a household with multiple users to simultaneously telework and engage in remote learning. Recipients are also encouraged to consult with the community on affordability needs."[47] In the Final Rules, Treasury reaffirms its commitment to funding projects that support broadband networks owned by smaller providers and entities that it stated in its interim rules, "Treasury also encourages recipients to prioritize support for broadband networks owned, operated by, or affiliated with local governments, non-profits, and co-operatives—providers with less pressure to turn profits and with a commitment to serving entire communities."[48]

- **Projects are encouraged to prioritize last-mile connectivity.** While Treasury underscores this, states and localities are not precluded from setting their own priorities, and other initiatives that could improve affordability by investing in capacity bottlenecks such as middle-mile or data center builds could be funded.

- **Infrastructure projects are expected to meet strong labor standards.** This includes project labor agreements, community benefit agreements, and wages at or above the prevailing rate with local hire provisions. Yet the final rules give states "significant flexibility" to implement the statute's "premium pay" requirements as long as the projects meets specific thresholds set by the Treasury.[49]

- **Projects can address a wide array of broadband-related concerns.** In addition to infrastructure, these State and Local Fiscal Recovery Fund dollars can also be used for an array of other initiatives that respond to the public health and economic impacts of the pandemic. While Treasury leaves the door open for a wide variety of fundable initiatives, it offers the general guidance that recipients should "identify a need or negative impact of the Covid-19 public health emergency and, second, identify how the [proposed] program, service, or other intervention addresses the identified need or impact."[50]

- **Allocations from these funds can be leveraged as matches for other broadband grant opportunities.** Because these funds are considered locally administered, if you are

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Organisation for Economic Co-operation and Development (OECD)." Interim Final Rules, page 70, U.S. Department of the Treasury.

[47] 31 CFR Part 35, Supplementary Information at p. 297.

[48] 31 CFR Part 35, Supplementary Information at p. 297-298; see also, Interim Final Rules, pages 76-77, U.S. Department of the Treasury.

[49] 31 CFR Part 35, Section 35.6(c), Supplementary Information at p. 392, 397; Treasury Overview of Final Rules at p. 7, 31, 35-36

[50] 31 CFR Part 35, Supplementary Information at pp. 24-26, reaffirming the statements from the interim rules; see, interim rules at p. 10.

already targeting a federal grant or state grant opportunity that requires matching funds, the Fiscal Recovery Funds can be leveraged for that purpose.

6.3.2 The State of Illinois, Department of Commerce and Economic Opportunity, will administer $300 million in broadband funds

The Department of Commerce and Economic Opportunity will administer $300 million in broadband funding with the goal of ensuring all residents have access to broadband services by 2026—which can go to both adoption and affordability programs. With local governments across Illinois considering use of state and federal funds for broadband—such as Local Fiscal Recovery Fund dollars available through the ARPA, the Benton Institute for Broadband & Society is leveraging philanthropic support to collaborate with the Illinois Office of Broadband and Illinois Extension on new engagement devoted to community-led broadband infrastructure expansion that positions local governments to succeed. The forthcoming Illinois ARPA Accelerator opportunity will engage an initial cohort of qualifying local governments with focused, in-depth preparation over a 14-week period beginning January 2022.[51]

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[51] https://www2.illinois.gov/dceo/ConnectIllinois/Pages/ARPAaccelerator.aspx

7 Examples of alternative infrastructure deployments in other cities may have informational value to ConnectWaukegan

In the initial weeks of our engagement with ConnectWaukegan, stakeholders expressed an interest in learning more about examples of deployments undertaken in other cities. CTC prepared a memo on several proposed and deployed networks, as detailed below. These are provided for informational purposes only. In the next section, we provide our design and cost estimate for a fixed-wireless deployment.

7.1 Urbana-Champaign: UC2B network

Urbana-Champaign Big Broadband (UC2B) is a not-for-profit agency in Urbana-Champaign providing broadband services to residences and businesses in the two cities. UC2B began in 2009 with stimulus funds from the American Recovery and Reinvestment Act through the NTIA to the University of Illinois. Today, UC2B is a collaboration between the University, the two cities, and service provider called i3 Broadband.

UC2B is both an Internet service provider (ISP) and a physical, fiber-optic broadband infrastructure. The agency oversees the operation of the network, customer service associated with the ISP, and provides broadband services, including to many residential subscribers who were previously unserved or underserved.[52]

7.2 Dallas: Educational wireless network pilot

With the move to distance learning due to the Covid-19 pandemic, the Dallas Independent School District (ISD) explored alternative options for meeting students' broadband needs. The DISD developed a pilot concept using wireless spectrum called "CBRS" (which is open access and has a low cost of deployment), and transmitters located at DISD buildings (to avoid facility lease fees) which in turn used fiber connectivity available from DISD's network.

In late 2020 and early 2021 DISD began to pilot a broadband service to student households located near one of the city's high schools, Lincoln High School. BearCom, in partnership with Motorola, installed an antenna and related radio equipment near the school and, in the first months, about 40 participating student households living within about a half-mile from the school were provided indoor Wi-Fi routers to deliver service within their homes. The first phase included indoor equipment with Wi-Fi and USB interfaces, capable of connecting to DISD-provided Chromebooks and other Wi-Fi-based devices.

The pilot user devices are all provided by DISD. Therefore, only DISD families authorized by DISD receive equipment or are allowed to use the network. Because the equipment is uniquely

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[52] Background and a timeline of the UC2B network is available here:
http://www.uc2b.net/uc2b2016/about/history/

identifiable through serial number, DISD is able to identify particular user devices on the network and their usage. DISD is also able to monitor and limit network usage by user. Backhaul was provided through the DISD fiber optic network and out to the DISD internet connection.

DISD is planning to test different equipment to expand the range of the network and improve performance to homes with more challenging lines of sight. One option is a window-mounted CPE radio that can be installed by the DISD family at a location with the best connection to the network, which then acts as a Wi-Fi hotspot connecting to student devices.

At approximately the same time as the DISD pilot, the City of Dallas also began a pilot, using Wi-Fi technology. Locations were selected in 10 priority zones consistent with proximity to City facilities, DISD and City collaborative projects, and areas of limited household connectivity to the internet.

The network is a Wi-Fi wireless mesh network with five to 10 outdoor access points in each of the areas. Access points are mesh routers installed on City-owned poles installed for this purpose. Devices on the poles are solar-powered, with battery backup. Backhaul is either with Charter cable modem circuits operating at best effort or mobile broadband connections. The intent is to upgrade the backhaul to fiber, as the pilot continues.

7.3   Cleveland: DigitalC nonprofit

DigitalC is a nonprofit organization that carries out digital equity projects in Cleveland including facilitating the provision of free or low-cost broadband service to low-income residents. Most recently, DigitalC began a project to provide a fixed-wireless broadband alternative to 225 households in Lexington Village, a low-income housing tax credit complex in Cleveland's Hough neighborhood.

The project received an award through the National Science Foundation (NSF). This funding was part of larger, $2.7 million grant program that made awards to six other communities for projects designed to provide internet through novel broadband technology solutions.[53] DigitalC's project also received funding from the Cleveland Metropolitan School District, Cuyahoga County, MetroHealth, Cleveland Clinic, Cleveland Public Library, and Case Western Reserve University.[54]

The project consists of rooftop antenna deployments using high frequency (mmWave) bands to create a mesh network serving the residents of Lexington Village, a townhouse development that was built in the 1980s and has cable service from Charter. The system currently provides speeds up to 50 Mbps download, 20 Mbps upload for each subscriber.

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[53] US Ignite and Project OVERCOME Select Seven Communities (us-ignite.org)
[54] DigitalC Connects High-Speed Internet to Cleveland's Lexington Village | Benton Institute for Broadband & Society

As of October 2021, ten households in Lexington Village had subscribed through the provider, EmpowerCLE. Families with children in the Cleveland Metropolitan School District pay no cost for the service. However, children without families are be charged $18 a month for the subscription. DigitalC recently stated that it expects to have all 225 households in Lexington Village wired for service by the end of 2021.

7.4   Madison, WI: Fiber-to-the-premises pilot

In 2015, the City of Madison engaged in a pilot project designed to make affordable internet access available to low-income residents who may never previously used broadband service—either because no service was available in their area, or because they could not afford it. The pilot was also intended to provide data that would inform any future broadband deployment efforts by the City.

One key lesson was that a paid service, even an inexpensive one, might find very low adoption rates in low-income neighborhoods, and that gaining permission from owners of apartment buildings or multi-dwelling units (MDU) can be challenging.

The City issued an RFP in 2015 for a two-year pilot program that would provide low-cost internet service to residents in certain neighborhoods: the Allied Drive, Brentwood, Darbo-Worthington, and Kennedy Heights neighborhoods. In October of that year, the City awarded a contract to ResTech, a local ISP. The company proposed an FTTP network to serve customers in MDUs in the pilot areas. MDUs ranged from two to more than 100 units, totaling more than 1,000 units in 161 buildings.

ResTech offered various levels of low-cost internet service starting at $9.99 per month for 10 Mbps service to $44.99 per month for 100 Mbps. ResTech also offered phone and television services.[55] The City canceled the contract effective January 2018. At that point, the pilot program had made service available in 86 buildings but had only 19 active customers, or an average of less than one customer for every four buildings.

During the pilot program, ResTech and the City encountered unanticipated barriers to providing access to many apartment buildings. In some cases, ResTech was unable to obtain permission because landlords had granted exclusive access to their buildings to other ISPs. In other cases, landlords were not responsive to communications from ResTech or the City.

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[55] "Low-Cost Internet Service," City of Madison, https://www.cityofmadison.com/information-technology/initiatives/low-cost-internet-service (accessed April 2018).

7.5   San Francisco: Fiber to affordable housing

Compared to Madison, San Francisco's "Fiber to Affordable Housing" program provided a more successful public-private model for providing a free high-speed service to residents of public housing.

The initiative provides a partnership model for providing free high-speed fiber or fixed-wireless internet access to buildings. The program is a result of a collaboration between the City and County of San Francisco (CCSF), the Mayor's Office of Housing and Community Development, and MonkeyBrains, a local fixed wireless ISP. The City provides free, high-speed internet to low-income residents by leveraging existing municipal fiber resources and staff expertise. The housing authority pays $10 per month per unit to MonkeyBrains. Importantly, and in contrast to the Madison pilot project, the service is free to residents (though it could be possible to build a modest cost into rent).

In 2009, CCSF created a position at the city's Department of Technology (DT) dedicated to bringing connectivity to low-income households in publicly subsidized housing facilities. The City was already relatively fiber rich and was able to bring fiber to many public housing facilities and create a Community Broadband Network (CBN) without allocating additional capital.

For housing facilities that were not located to existing City fiber, DT used point-to-point wireless equipment to establish connectivity to affordable housing buildings. DT worked with the Housing Authority to ensure that whenever a facility was renovated, they added Ethernet jacks to every room. In 2011, the Housing Authority provided also provided DT with $20,000 to create Wi-Fi networks in certain common areas of public housing facilities, but not to each unit.

The San Francisco Housing Development Corporation engaged in a competitive, technology-neutral, bidding process and selected MonkeyBrains to provide free high speed (at least 100 Mbps) broadband service to each unit in newly renovated subsidized housing facilities. MonkeyBrains offered free installation of wireless access points and wired access to each individual unit.

By 2019, the effort had resulted in more than 1,500 low-income families having access to long-term sustainable internet access at no cost to users. The project's second phase is extending this to a further 1,600 units.[56]

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[56] https://tech.sfgov.org/news/fiber-housing/

7.6　Cambridge, MA: Housing authority deployment

The City of Cambridge, MA, is about to launch a municipal broadband study with an initial focus on low-income housing. This study will not be complete until late 2022, well after this study for Waukegan is complete.

But Cambridge already has some experience in trying to solve problems in public housing. In 2015, seeking ways to provide an alternative to Comcast in its buildings, the Cambridge Housing Authority issued a request for proposals (RFP) offering rooftop rights at two CHA developments for fixed wireless internet services that could provide high-speed broadband services by mounting wireless receivers on the roof and using existing in-building wiring to reach individual units.

Under the RFP, the winning company was to own the rights to designated roof locations at two complexes, the 19-story Millers River apartments and the eight-story Roosevelt Towers development. The RFP made the bidders responsible for the installation, maintenance, administration, and security of the antenna site and to offer service for ten years with two renewable five-year terms—and did not require the CHA to contribute any funds. Because the buildings were of a significant height, the fixed-wireless providers would also get the ancillary benefits of being potentially able to extend the reach of their networks to other sites in Cambridge.

NetBlazr, a local fixed wireless provider, was the winning bidder and now provides symmetrical service using in-building wiring at 100 Mbps at Roosevelt mid-rise and will offer at 200 Mbps or 500 Mbps at Millers River (the building is undergoing renovations that will include Cat 5 cabling, which can support the faster speeds). NetBlazr's low-income program offers a $20 discount to residents of public housing. Comcast is also available in the buildings, meaning families who qualify can get service for $10 per month with speeds of 50 Mbps download, 10 Mbps upload.

The effort was one part of the CHA's efforts to make Internet access easier and more affordable for residents. The CHA is also providing free Wi-Fi in comfortable indoor common areas in several CHA housing developments. However, NetBlazr reported in 2020 that four years into the program, it has only a handful of subscriptions in the Roosevelt mid-rise. (The Millers River project was still undergoing renovations and has no subscriptions yet.) The reasons for low uptake are not clear, but one potential issue in 2020 was that the City began aggressively providing mobile hotspots and Chromebooks to families of school-age children.

The effort dovetails with the CHA's efforts to converting its entire federally funded public housing portfolio to the project-based voucher program in a multi-year effort that involves capital investments designed to upgrade living conditions and improve energy efficiency. The effort also

includes adding ethernet cabling in the buildings – which will allow for the fixed-wireless service to reach units.

7.7   Baltimore: Housing authority designs

The Housing Authority of Baltimore City (HABC) owns about 7,000 housing units throughout the City and serves 20,000 residents. Nearly 80 percent of these housing units are located in 11 multi-dwelling complexes, each containing 100 or more individual residential units.[57]

The City is considering deploying City-owned fiber to public housing facilities to provide free broadband internet service to residents using cost-effective Wi-Fi technology, with a focus on the larger, higher-density housing complexes for initial phases. CTC has been consulting on the project. The deployment pilot has not yet been executed and does not yet have an operational model; rather, if it occurs, it will provide a "sandbox" for the Housing Authority to develop operational infrastructure and processes.

The idea is that the population density of HABC's multi-dwelling buildings represents an opportunity to leverage City communications infrastructure to deliver fixed broadband. Connectivity over City fiber can replace costly leased connections currently required for resident kiosks and administrative systems. Because HABC owns these properties, which span many blocks in some cases, the deployment complexity and costs could likely be reduced in relation to access to critical infrastructure required in any broadband deployment scenario, such as existing underground conduit, building rooftops, and private easements.

CTC estimated that using City fiber, the complete capital costs for a deployment to two high-rise complexes owned by HABC (Rosemont Tower and City View at McCulloh) to be $350,000, or an average cost of $520 per unit. This included all indoor cabling infrastructure and Wi-Fi equipment to serve the approximately 660 housing units in these two complexes. We further estimated operating expenses (comprising hardware maintenance, internet capacity, and network monitoring) at a total monthly cost of approximately $2.50 per residential unit, or approximately $20,000 annually for deployment to the two high-rise apartment complexes.

CTC also developed an engineering plan for lower-rise developments, the Gilmor Homes with 548 residential units and the Latrobe Homes with 672 residential units. The City is planning a pilot project at these facilities to bring fiber and free high-speed broadband to these units, and also launch digital literacy programs.

The Gilmor Homes units are spread across 34 low-rise apartment buildings. These sites present challenges because they are two- to three-level structures with no common indoor cable pathways or utility closets. This requires exterior utility points-of-entry for each unit. The network

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[57] https://www.habc.org/media/1459/strategic-plan-community-workshop-no-1.pdf

design uses existing closed-circuit TV fiber for network segments from hub to each apartment building, where available. CTC estimated that building fiber to this kind of low-rise unit will cost a total of $1,200 per unit.

7.8   Seattle: Targeted free Wi-Fi

Seattle provides free Wi-Fi in 76 sites and continues to explore ways to use existing and planned fiber assets in order to expand free or low-cost broadband connections in targeted areas. The City designated digital equity zones deemed important to improving internet access for lower-income residents and has prioritized deploying additional Wi-Fi access points in those locations.

The City is also working on connecting Seattle Housing Authority properties to City fiber. Using City fiber for backhaul, the Housing Authority will be able to purchase bulk bandwidth at far less than it would pay a private ISP to offer service to households; the Housing Authority is considering providing free or low-cost service to the household. Residents would enjoy far greater bandwidth than ISPs offer to their discount-service customers.

Meantime, the City is trying to increase awareness of low-cost service from discounted programs from local ISPs. A recent community survey showed that only 53 percent of potentially eligible households were even aware of the discounted offerings. In response to those findings, the City has prioritized outreach to raise awareness through community partners and various City agencies already working with target communities. The City has found that the sign-up process for the discounted services is often complex, especially when an eligible household has existing service from the ISP or wants to bundle services. In some cases, City staff work with eligible households to navigate the sign-up process.

7.9   Illinois Century Network (ICN)

ConnectWaukegan has expressed interest in the Illinois Century Network (ICN), a high-performance fiber network for educational, research, governmental and healthcare organizations in Illinois. ICN is the largest state education network in the country, providing connectivity to more than 6,000 community anchor institutions in Illinois. ICN states on its website that it has service agreements designed to facilitate broadband deployment in Illinois and offers attractive wholesale pricing to promote broadband to Illinois underserved areas.

The language "underserved areas" may refer to rural areas only served by slow DSL service not urban areas served by cable. Our inquiries with the ICN to clarify are outstanding. In any case, even if the ICN could be used, the map we received from ICN staff indicates that the network does run through Waukegan. Figure 70 shows the ICN route in relation to Waukegan.

Figure 70: ICN Fiber Route Near Waukegan
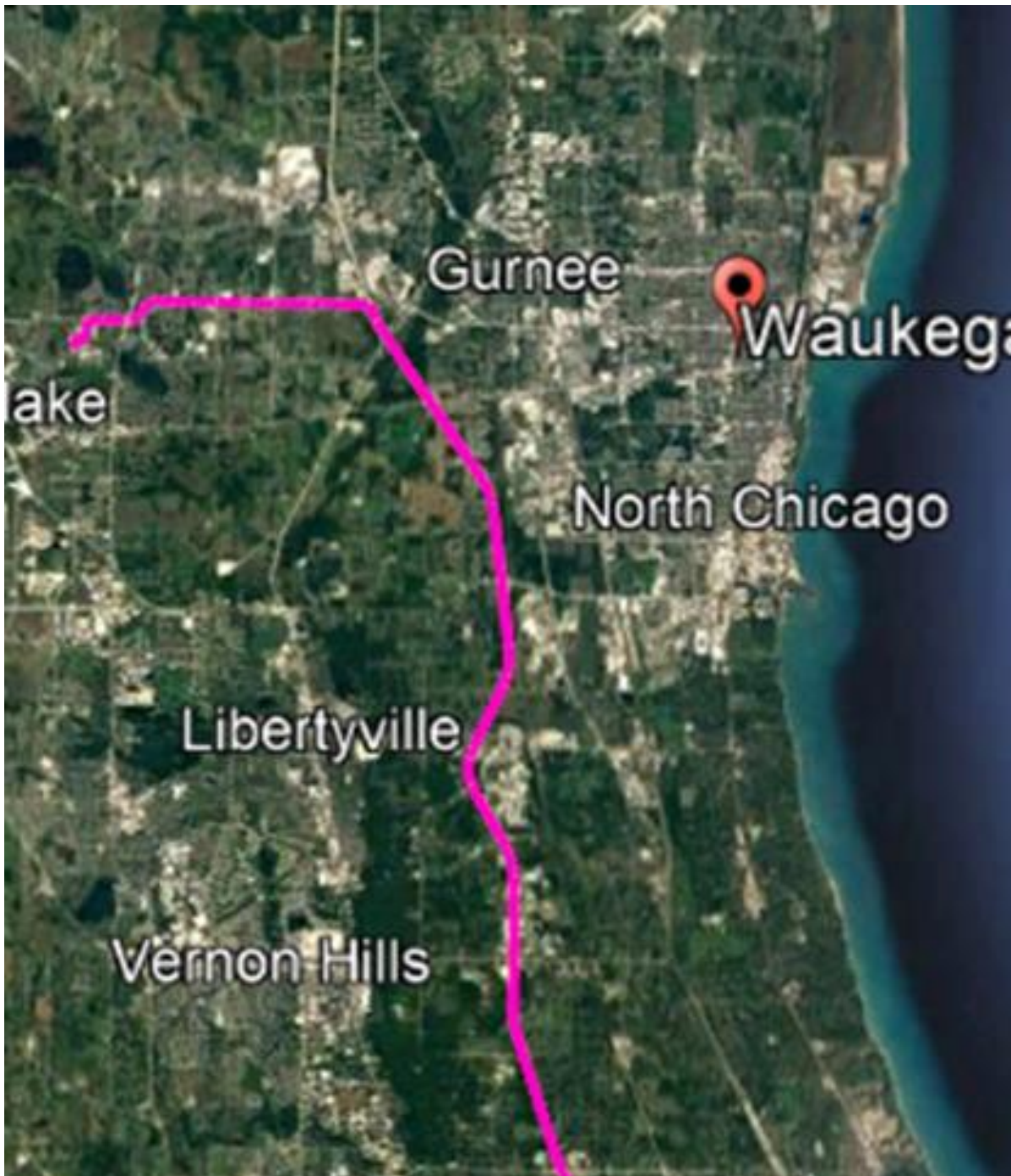
It may be useful if ICN fiber were extended into Waukegan, but we caution that the existence of such a resource is not necessarily a significant factor in the economics of any future deployment. Most of the cost of a broadband deployment lies in "last mile" construction, and in operations. Waukegan also has commercial fiber available from Crown Castle.

8   A fixed-wireless deployment under one of three models could provide an additional means of providing connectivity

Although Comcast service is nearly ubiquitous in Waukegan, affordability is a major problem for many residents, as noted above, and some undocumented families are unwilling or unable to enroll in broadband service. The Waukegan Community Unit School District #60 (WCUSD #60) has sought to address access or affordability gaps by providing wireless (cellular) hotspots to some students, but this is coming at a high cost of more than $400,000 to serve 2,000 students.

Deploying a fixed-wireless network—though limited in coverage and numbers of users—could deliver broadband speeds to additional residents or expand options for students. A fixed wireless network could represent an additional strategy for increasing broadband access—another toolkit that includes the hotspot program as well as efforts to help low-income residents enroll in the ACP and low-cost broadband programs.

The sections below describe high-level designs and cost estimates for three potential fixed wireless network deployment scenarios—each of which requires base station antennas connected to fiber backhaul.

The first two scenarios efficiently provide coverage across the City using a selection of more than 80 possible sites provided by ConnectWaukegan, using base stations on 11 structures to create a network able to deliver 25 Mbps download, 3 Mbps upload service to approximately 2,000 users simultaneously. These two scenarios are the same except that in one, WCUSD #60's existing fiber would be leveraged to save money, with the tradeoff that this version network would only be able to serve students because of restrictions on the use of the WCUSD #60's fiber.

The third design would use only WCUSD #60's buildings and fiber, making it a network that is also usable only by students and would cover 35 percent less of the City because of the coverage limitations that present themselves when only school sites are used. The significant advantage of this model is that it could achieve a much lower per-user cost because there would be no need to build any fiber beyond that already built or contemplated by the WCUSD #60. And by increasing the number of base stations (from the 11 base stations used in the first two models), this model would be capable of delivering 25/3 service to approximately 2,800 users simultaneously.

In all cases the models reflect high-level estimates and use conservative assumptions including:

- **A $30,000 estimate for installation on each rooftop.** Depending on site conditions, installations could cost less and reduce per-user costs. The $30,000 budget also allows flexibility to add masts if needed to increase the height of the antenna. Using a lower

"sled" mount would save on costs but mean the base station is just a few feet above roof level.

- **Realistic assumptions about delivered speeds.** The as-designed networks are expected to provide consistent 25 Mbps download, 3 Mbps upload speeds simultaneously and consistently to 2,000 households using free CBRS spectrum. While CBRS technology can deliver 100 Mbps in some circumstances, this is unlikely to be experienced on a loaded network or in less-than-perfect line of sight conditions.

- **A sensible combination of fixed and portable customer equipment.** A network that relies entirely on portable customer equipment will have lower speeds and reliability. Portable equipment will have a less optimal line of sight and less antenna gain. Performance may suffer because of signal loss from walls and windows. Portable equipment will work in many of the closest locations to the antenna, but not everywhere. Significantly increasing the percentage of users of portable equipment will sharply increase the number of antenna sites that would be needed, as well as infrastructure to connect those sites.

The three models are as follows:

- **Model 1:** We estimated the costs of building and operating a fixed wireless network that would have lower construction costs because, while incremental fiber would need to be constructed, it would leverage existing WCUSD #60 fiber (referred to below as "school fiber") where available.[58] This network with 11 base stations would be limited to serving only students. **Over five years, the total estimated cost (capital and operating) to serve up to 2,000 student households would be approximately $8.7 million or $4,275 per household.**

- **Model 2:** We estimated the costs of building and operating a fixed wireless network that could be used by any member of the community; this scenario would require building new fiber to all 11 base station sites. **Over five years, the total estimated cost (capital and operating) to serve up to 2,000 households would be approximately $10.1 million or $4,930 per household.**

- **Model 3:** In the third scenario, which would be limited to serving only students, we estimated the costs of building and operating a fixed wireless network with base stations that are located only at schools and that use only existing or planned school fiber (i.e., with no additional fiber construction required). This model uses 15 schools out of the 24 possible school locations. (Some schools are close enough to each other that building to more than 15 sites would create coverage

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[58] The WCUSD #60 has expressed a willingness to use its fiber network and buildings for a fixed wireless network deployment.

redundancies and additional interference.) Because the coverage in this model is limited to addresses that can be feasibly reached from school sites, the geographic coverage possible with Model 3 is 35 percent less than in Model 1 and Model 2. **Over five years, the total estimated cost (capital and operating) to serve up to approximately 2,800 households would be approximately $7.6 million or $2,745 per household.**

Table 32 summarizes the estimated five-year and 10-year costs, numbers of households served, and per-user costs for the three models. These costs assume a conservative five-year life of the wireless base station equipment, meaning the equipment would need to be replaced in year 6. Those replacement costs are included in the 10-year costs. Notably, if improved technologies are available, the system could be upgraded by replacing all electronics at year 6.

Table 32: Comparison of total five-year costs for candidate fixed wireless models

Comparison	Model 1*	Model 2	Model 3*
Households covered	2,000	2,000	2,800
5-year costs (total / per user)	$8.7 million $4,275	$10.1 million $4,930	$7.6 million $2,745
10-year costs (total / per user)	$15.1 million $7,426	$15.7 million $7,700	$13.6 million $4,859

* Restricted to students only

8.1 Network objectives, design assumptions, and technical considerations

8.1.1 Objectives and design assumptions

The key objectives for the candidate fixed wireless network designs included these:

- **Provide coverage in as much of Waukegan as possible** – a design should be ambitious and cover as much of the city as possible

- **Maximize use of existing publicly owned infrastructure** – the design should locate access point antennas on public infrastructure, including the tallest available sites for Models 1 and 2 and only schools for Model 3

- **Deliver broadband speeds** – the network should be designed to reliably deliver broadband speeds (25 Mbps download, 3 Mbps upload) to 2,000 users simultaneously. Due to the technical limitations of current off-the-shelf CBRS fixed wireless technology, only a certain number of subscriber locations will receive consistent broadband-speed service from each access point.

- **Providing one option (Model 3) that only uses schools as base stations and only uses school fiber to connect the antennas** – this network would have economies inherent in using existing fiber, with the tradeoff that only students could use it and it would not be able to cover 35 percent of the City

Accordingly, the network designs were geared to:

- Provide consistent access to speeds of 25/3 for broadband service

- Use free CBRS spectrum

- Use 40 MHz of CBRS spectrum, which is currently available according to the spectrum allocation system that monitors and assigns CBRS capacity

- Use existing publicly owned structures as access antenna sites to avoid lease or structure construction costs

- Use fixed wireless network equipment currently available off-the-shelf

- Use LTE technology for wireless transmissions

- Use a point-to-multipoint topology, which is the most suitable for a network providing services to a residential area

- Serve as many subscriber locations as possible from a single access antenna site within the service area

- Have access to fiber backhaul that provides adequate capacity and speeds

8.1.2   Spectrum considerations

Broadband speeds in compliance with the FCC's benchmark (i.e., 25 Mbps download, 3 Mbps upload) are now more technically feasible using fixed wireless networks than in the past, owing to newly available spectrum and advanced wireless technologies. Even faster speeds may become feasible as future generations of equipment using more advanced technologies become available. However, the number of available channels, the bandwidth of each channel, and the type of spectrum are key to determining the level of service a connected household will obtain.

Fixed wireless networks typically use the following spectrum and associated frequency bands (Table 33):

Table 33: Overview of fixed wireless spectrum

Spectrum	Frequency Band
Educational Broadband Service (EBS) (licensed)	2.5 GHz
Licensed Citizens Broadband Radio Service (CBRS)	3.5 GHz
Unlicensed CBRS	3.5 GHz
TV White Space (unlicensed)	500 MHz
Other Unlicensed	900 MHz, 2.4 GHz, and 5 GHz

If licensed spectrum is used, then the network is guaranteed the full bandwidth in the channel(s), in turn guaranteeing expected performance. If a network relies on unlicensed spectrum, that spectrum is shared and dynamically allocated according to the number of users at a given time. This and other limitations contribute to determining the number of addresses that can be served by broadband within an access point's coverage area.

CTC found that licensed spectrum suitable for fixed wireless was not available in the Waukegan area, but certain unlicensed spectrum is suitable. Although other unlicensed spectrum is obtainable, only the CBRS and 5 GHz bands have channel widths capable of delivering broadband speeds to a reasonable number of simultaneous users on a wireless network using proven, LTE technology. (This spectrum will also be suitable for 5G as that technology becomes available in the CBRS band.)

Unlicensed CBRS is obtained via registration with a dynamic ("of the moment") spectrum assignment system that manages access to all users in each area. As such, speeds for a fixed wireless network using CBRS are highly dependent on the number of users at a given time and can vary.

GAA CBRS spectrum is currently available in the Waukegan area. As of February 24, 2022, a total of 110 MHz is available in the CBRS band according to Google Network Planner, which reads the CBRS Spectrum Access Service (SAS) and produced the map in Figure 71. However, fixed and mobile wireless providers, businesses, and nonprofit organizations are likely to use unlicensed spectrum in the area, so the availability of spectrum may change over the network's lifetime.

Figure 71: Available CBRS spectrum[59]
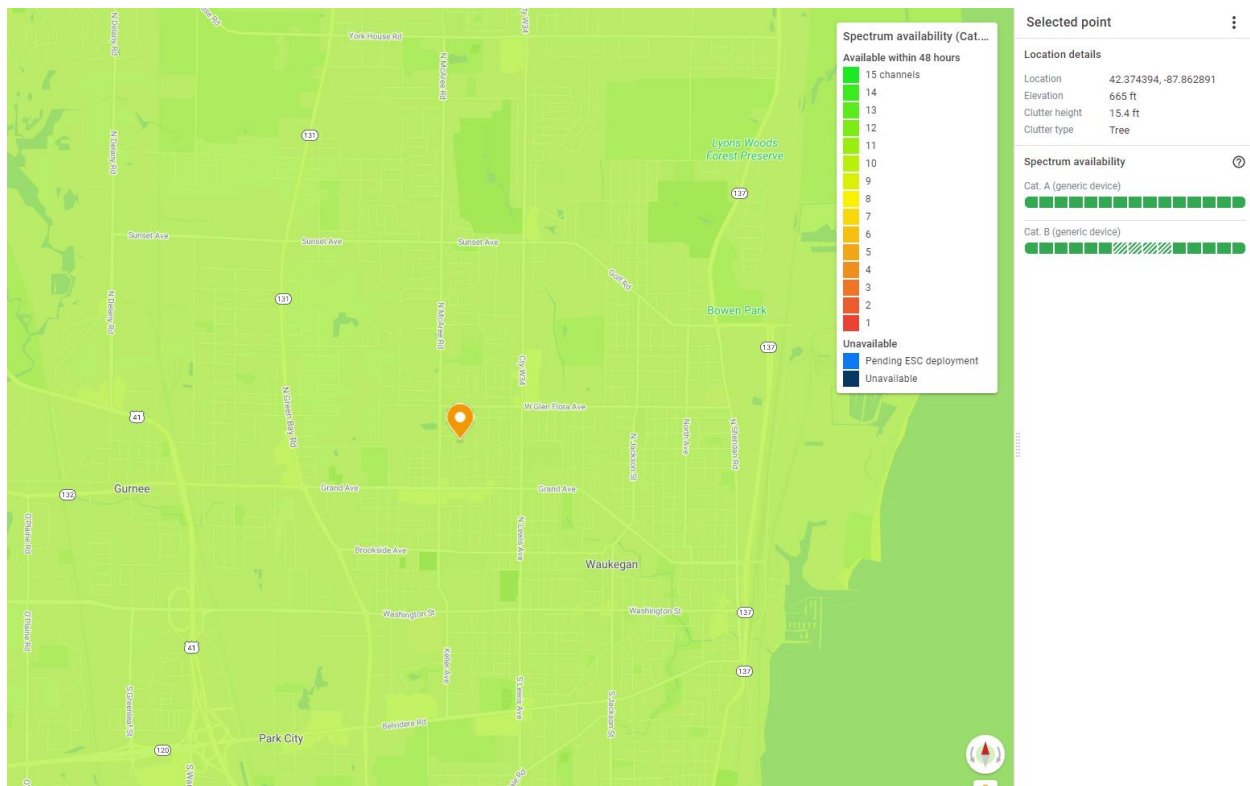
8.1.3 Customer premises equipment

Outdoor subscriber antennas will have better reception and transmission capabilities than antennas located indoors because the signal does not have to penetrate the building's outer wall. Outdoor antennas may be attached to a building or a mast on the premises; Figure 72 shows a scenario where a subscriber has placed the antenna on their roof.

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[59] Google Network Planner is the source of the map of spectrum availability for the CBRS band.

Figure 72: Sample outdoor subscriber antenna configuration
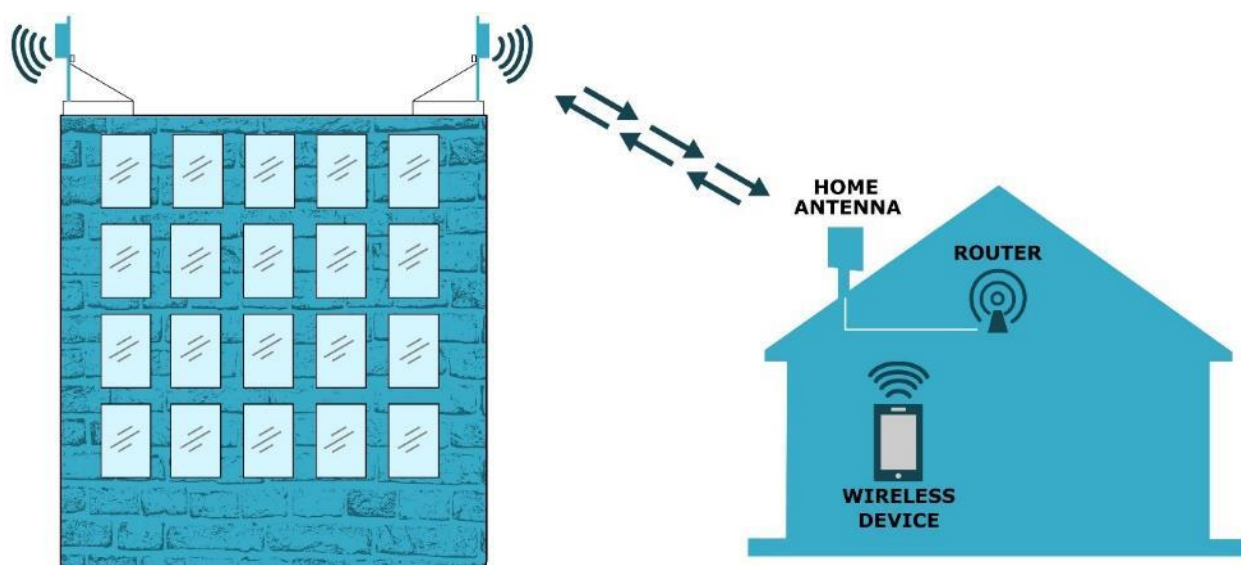
A mix of indoor and outdoor customer premises equipment (CPE) will be required. Outdoor CPEs are often more expensive but, in addition to better connection to an access point, use weatherproofing and ruggedized reinforcements to withstand all four seasons. A CBRS CPE includes an LTE/Wi-Fi router, typically resembling a hotspot provided by a mobile provider, communicating with end user devices. The design assumes a mix of three CPE types will be evenly distributed among the connected households. The CPE types are as follows:

- Outdoor-mounted high-gain CPE, which is used at the edge of the coverage area and must be professionally installed. This includes an integrated high-gain antenna with a power supply unit connected to a home router via ethernet cabling.

- Outdoor-mounted medium-gain CPE, which is used in the primary coverage area and can be self-installed. This includes an integrated medium-gain antenna with a power supply unit connected to a home router via ethernet cabling.

- Indoor-mounted low-gain CPE, which is used in the primary coverage area and can be self-installed. This includes an LTE/Wi-Fi router, typically resembling a hotspot provided by a mobile provider, communicating with end user devices.

CBRS CPE is available in two categories—Category A Citizens Broadband Radio Service Device (CBSD) and Category B CBSD—each with a different maximum effective isotropic radiated power (EIRP) threshold. To achieve maximum coverage and performance, we selected Category B LTE base stations and a mix of CPE with the understanding that power levels may be reduced by the dynamic spectrum assignment mechanism for unlicensed CBRS spectrum (discussed above) at any given time. We assumed a maximum EIRP of 40 dBm for CBRS transmissions.

The three types of CPE proposed for the candidate network are shown in Table 34. The base station equipment is also Category B.

Table 34: Maximum allowable EIRP levels in a CBRS network

CPE	Maximum EIRP (dBm/10 MHz)	Device Type	Relative Proximity to Base Station Sites
End User Device	23	Indoor CPE	Close
Category A CBSD	30	Outdoor non-professionally installed CPE	Intermediate
Category B CBSD	47	Outdoor professionally installed CPE	Far

8.2 Fixed wireless network designs and cost estimates for citywide coverage using a selection of all sites provided by ConnectWaukegan (Model 1 and Model 2)

The conceptual, high-level fixed wireless design presented here follows best practices, considers available spectrum, and incorporates LTE technology and currently available off-the-shelf equipment (for details on the equipment used by CTC for purposes of cost estimation, see Section 8.2.3.1).

This section describes the first two models using 11 base station sites—a mix of schools and other sites—selected from the more than 80 options provided by the Waukegan Community Broadband Taskforce. One of these two options uses school fiber at and between the school sites, reducing costs but making the network usable only by students.

Section 8.3 describes a third model using only school sites and school fiber, but with the same spectrum, technical considerations, and assumptions.

8.2.1 Base station locations

Fixed wireless broadband is delivered via access point antennas at a base station (typically mounted on towers, masts, monopoles, or rooftops) to a subscriber antenna. Subscriber antennas (at a home or other building) can be located indoors or outdoors depending on the distance to the access point antenna and the amount of "clutter" between the subscriber antenna and the access point antenna. Clutter includes obstructions such as trees and their foliage and buildings. Weather events such as rain and fog can also impact the performance of a wireless transmission. Line of sight between the two antennas is ideal.

To design the network, CTC gathered information from ConnectWaukegan stakeholders about a range of potentially available base station sites for mounting the fixed wireless antennas. This list

included all Waukegan public schools plus a variety of City sites and other sites identified by ConnectWaukegan.

We selected from the list to obtain the best physical distribution across the city and to emphasize taller structures. CTC modeled coverage for each location so that users within the coverage area would receive a sustained throughput of 25 Mbps download and 3 Mbps upload speeds.

We systematically removed sites to reduce overlap and interference, keeping sites that covered the most addresses. The optimization process narrowed the access point locations to 11 sites to cover the Waukegan area. The access points are listed in Table 35, and the site locations are mapped in Figure 73.

A more detailed design would be needed to determine final site selection, exact antenna placement, azimuth, down tilts, and other network configurations. Also, it would be possible to deliver broadband service to more addresses by adding base station antenna sites.

Table 35: Base station sites – Model 1 and Model 2

Base Station Site	Address	Owner
Lyon Magnet School	800 S. Elmwood Ave.	WCUSD #60
Waukegan Fire Station #2	4505 W. McGaw Rd.	City of Waukegan
John S. Clark Elementary School	601 Blanchard Rd.	WCUSD #60
Little Ford Elementary School	1775 Blanchard Rd.	WCUSD #60
H. R. McCall Elementary School	3215 McAree Rd.	WCUSD #60
Fountain Square Booster Pump Station	621 Lakehurst Rd.	City of Waukegan
Concrete Water Tower	102 Keller Ave.	City of Waukegan
Beechnut Booster Pump Station	743 Beechnut Ave.	City of Waukegan
Cinnamon Lake Towers	2725 W. Glen Flora Ave.	Unknown
Lilac Ledge Apartments	542 Washington St.	Unknown
Lakeside Tower Apartments	200 Julian St.	Unknown

Figure 73: Map of base station sites – Model 1 and Model 2
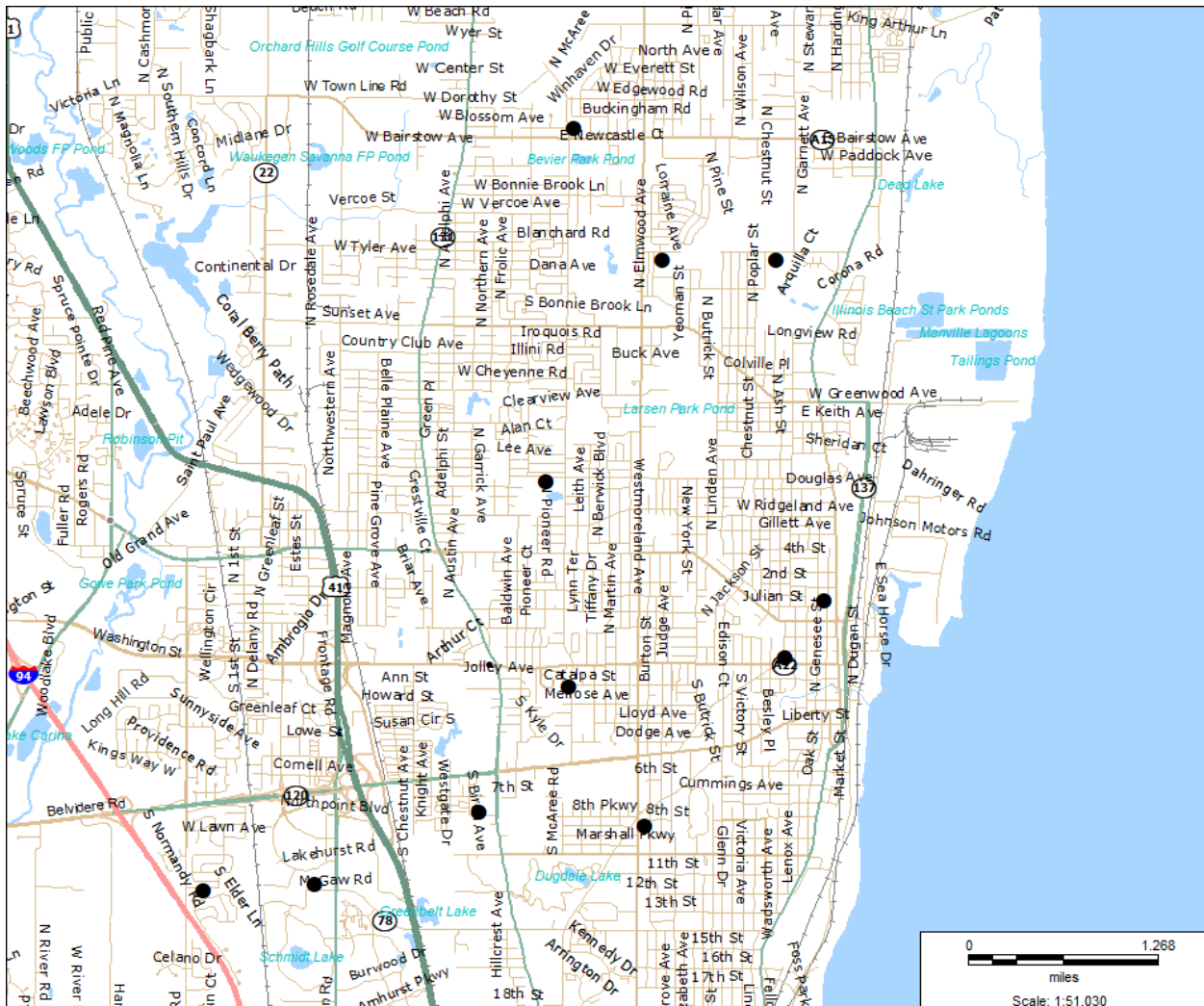
8.2.2 Estimated coverage area

The coverage area of an access point for any wireless network is typically determined by the spectrum, technology, (allowable) power, receiver gain, equipment, antenna pattern, antenna physical configuration, and clutter. Capacity, or number of users with suitable service, in a wireless network is primarily limited by the bandwidth of the spectrum in use, as well as these other characteristics.

We used the Longley-Rice type propagation model (typical for modeling coverage in irregular terrain) with 10-meter resolution and the following assumptions to simulate a "real world" scenario: two 20 MHz unlicensed CBRS channels;[60] three-sector antenna at site with antenna

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[60] While more spectrum is available in the band and more spectrum appears to be open in the Waukegan area, this spectrum use is the maximum allowed by standard LTE CBRS equipment at a single site. Additional equipment could be added at the site for increased capacity, but the cost per address would be similar.

tilted down; standard LTE configuration parameters; and EIRP (signal level) that compensates for other users on the spectrum.

Using the above parameters and our stated assumptions, we estimated the number of addresses within the coverage range of the selected sites that could be served with broadband (25 Mbps download/3 Mbps upload by the FCC standard). Figure 74 (below) illustrates the coverage area.

Although some additional engineering may increase the number of locations served, capacity is limited mostly by spectrum. Assuming each user consistently requires at least 25 Mbps downstream and 3 Mbps upstream, the network can provide enough capacity for 186 households per site and 2,046 households for the entire network. As noted above, this is not a complete solution, because there are more addresses within signal range of each access point (Table 36).

Table 36: Households within range of Model 1 and Model 2 fixed wireless networks

Vertical Asset	Households Within Range
Waukegan Fire Station #2	940
Lilac Ledge Apartments	5,047
Concrete Water Tower	1,784
H. R. McCall Elementary School	1,946
Lyon Magnet School	1,445
Lakeside Tower Apartments	9,269
Beechnut Booster Pump Station	2,223
John S. Clark Elementary School	940
Cinnamon Lake Towers	5,024
Little Ford Elementary School	1,985
Fountain Square Booster Pump Station	1,119
Total	31,722

Figure 74: Approximate fixed wireless network coverage map – Model 1 and Model 2
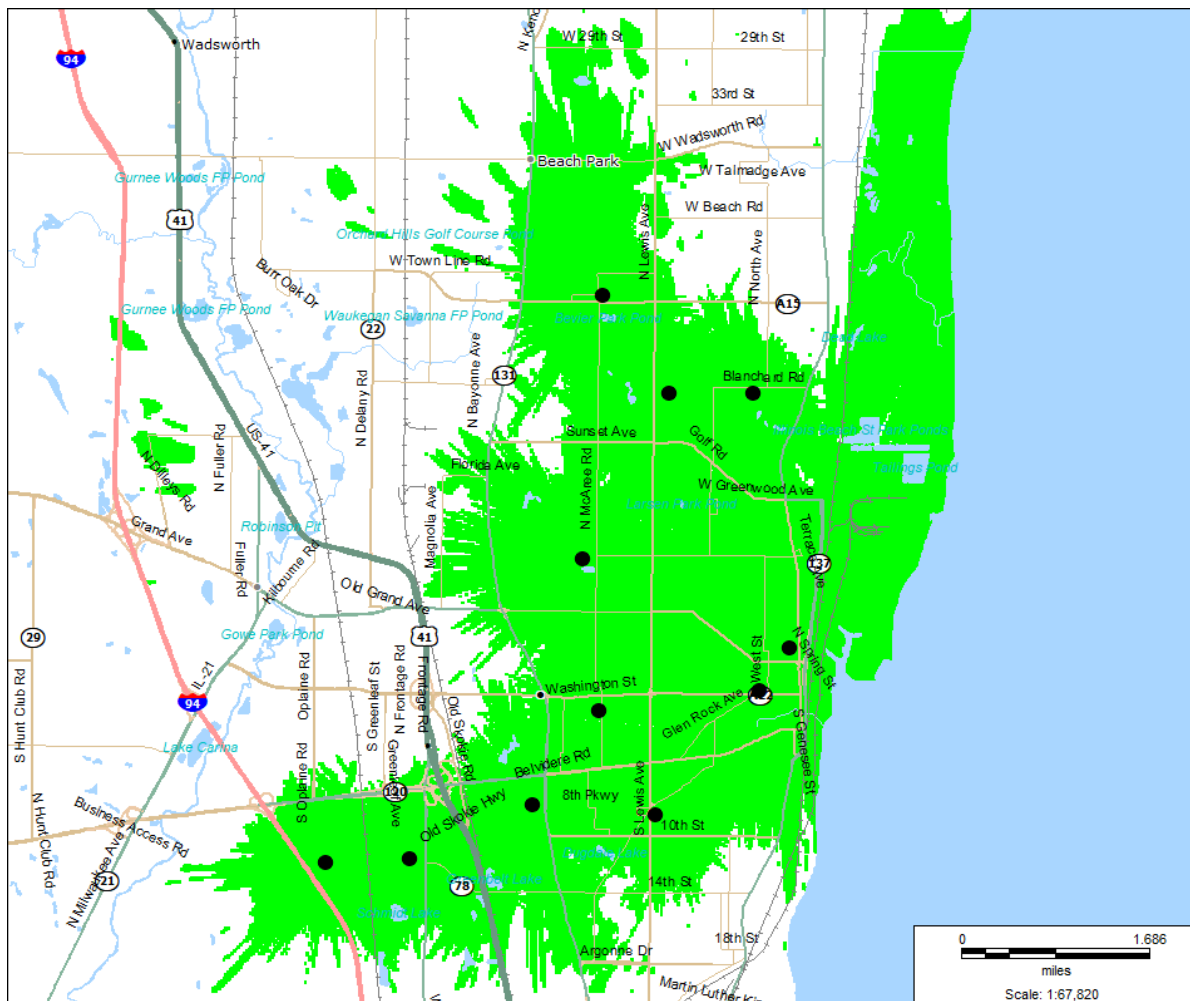
8.2.3   High-level cost estimates for Model 1 and Model 2

Based on the candidate designs, a fixed wireless network with base stations on 11 structures that delivers 25/3 Mbps service to approximately 2,000 users in Waukegan would require the following estimated capital investment and ongoing operating costs:

- *Model 1 – extend school fiber to base stations*: This scenario assumes the network would only serve students and would leverage existing school-owned fiber where possible to connect the 11 sites. The total estimated capital cost for this option is $3.9 million or $1,900 per user. The total annual operating cost for this option is approximately $923,000 or $38 per month per user.

- *Model 2 – build all new fiber*: This scenario assumes the network would be available to any resident and would require construction of all new fiber to connect the base stations. The total estimated capital cost for this option is $5.0 million or $2,400 per user. The total

annual operating cost for this option is approximately $973,000 or $40 per month per user.

Table 37 summarizes estimated capital costs for the two approaches;[61] Table 38 summarizes the estimated annual operating costs.

Table 37: Estimated capital costs for Model 1 and Model 2 fixed wireless networks

Comparison	Model 1: Extend School Fiber	Model 2: Build All New Fiber
Number of access points	11	11
Total addresses within wireless coverage area	31,722	31,722
Addresses that can be served at broadband speeds	2,046	2,046
Fiber construction costs (high estimate)	$2,081,250	$3,166,250
Wireless core and distribution costs (without CPE)	$691,974	$691,974
Wireless core and distribution (with CPE)	$1,805,018	$1,805,018
Wireless cost per address served	$882	$882
Total fiber and wireless costs (without CPE)	$2,773,224	$3,858,224
Total fiber and wireless costs (with CPE)	$3,886,268	$4,971,268
Total capital cost per address served	$1,899	$2,430

Table 38: Estimated operating expenses for Model 1 and Model 2 fixed wireless network

Scenario	Comparison	Year 1	5-Year Total	10-year Total
Model 1: Extend school fiber	Fiber opex	$150,000	$788,449	$1,680,507
	Wireless opex	$773,108	$4,063,708	$8,661,420
	Total opex	*$923,108*	*$4,852,157*	*$10,341,927*
Model 2: Build all new fiber	Fiber opex	$200,000	$1,051,266	$2,240,676
	Wireless opex	$773,108	$4,063,708	$8,661,420
	Total opex	*$973,108*	*$5,114,973*	*$10,902,096*

The five-year operating costs of the fixed wireless network, including the fiber construction, are estimated to be $4.9 million to $5.1 million, depending on the fiber construction scenario (model).[62]

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[61] The per-household cost estimates assume the network operates at full capacity—that is, the maximum number of subscribers use the service. If the number of households is lower than full capacity (i.e., the "take-rate" is lower), the cost to build the network would not change, but there will be fewer households per antenna site, which will result in a higher per-household cost.

[62] Operating costs include a yearly share of base station equipment and CPE replacement over a six-year lifecycle.

8.2.3.1 *Equipment used in the cost estimate*

CTC used pricing from Nokia's CBRS solution to inform the cost estimate. Our goal was to use off-the-shelf equipment for the purposes of making a high-level estimate. This choice does not represent an endorsement of one vendor over another; other solutions are available. The makes and models of the equipment used in CTC's estimate are provided here at ConnectWaukegan's request.

The Nokia CBRS base station is comprised of four kits. These main components are described in Table 39:

Table 39: Base Station Components Used in Cost Estimate

SKNDEDGN1038	NDAC Medium+ Edge Switch kit	This includes the router/switch required at each site for connectivity, a GPS for synchronization, and other parts
SKNDBBUN1005	NDAC Airscale 4G Indoor Base Band Kit	This is the base band equipment on the ground in a cabinet that connects to the equipment on the tower or roof
SKNDACPN1151	NDAC Site Power Solution - Radio	This is the power solution for all the base station equipment
SKNDACPN1186	NDAC Airscale Micro RRH Kit B48	This is the remote radio head, antenna, cables, etc.

Nokia uses the FastMile solution for end user equipment. It has three different CPE types with different power classes. Details on these components are provided in Table 40.

Table 40: End User Equipment Used in Cost Estimate

3TG01453AA	FastMile Receiver B48 high gain CPE-CBSD (4G01-C)	Outdoor high gain, high power CPE. Must be installed by professional. Registers to the SAS. Mounted on home.
3TG01453AB	FastMile Receiver B48 high gain EUD (4G01-D)	Outdoor, medium gain and power CPE. Can be installed by end user. Mounted on home.
3FE49234AA	Beacon 1.1, US Plug, 1 pack 2xGE UNI, Wifi5 2+2 (Beacon 1.1)	Home router used for both outdoor scenarios.
3TG00389AA	FM 4G Gateway 1 US-plug B66/7/42/43/28 (4G08-12W-A)	Indoor integrated router and home gateway. Self-installed.

8.2.3.2 *Capital cost for fiber backbone needed to interconnect base station locations*

In order to provide reliable, high-speed connections to the base station locations, we recommend that fiber optic connections be made to each location. A purpose-built fiber network can provide the greatest capability and reliability and would be scalable for future generations of networks and other purposes.

We analyzed two approaches to securing the required fiber connections:

- In the first approach (Model 1), we estimated the cost of constructing incremental fiber to extend the school fiber to the 11 locations

- In the second approach (Model 2), we estimated the cost of constructing a new 17.7-mile dedicated fiber network that interconnects the 11 base stations

In Model 1, which leverages existing school fiber, constructing and connecting 11.5 miles of underground fiber in Waukegan would cost $1.5 million to $2.1 million (Table 41) assuming underground construction costs of $125,000 to $175,000 per mile. The map in Figure 75 (below) illustrates the fiber routing corresponding to this estimate.

Table 41: Model 1 capital cost to extend school fiber (low and high estimates)

Item	Low Estimate	High Estimate
Fiber optic outside plant (OSP) construction	$1,437,500	$2,012,500
Network hardware	$55,000	$55,000
Network integration and testing	$13,750	$13,750
Core switch	$25,000	$25,000
Total capital costs	**$1,506,250**	**$2,081,250**

Figure 75: Routing of incremental fiber network from school fiber to base station sites (Model 1)
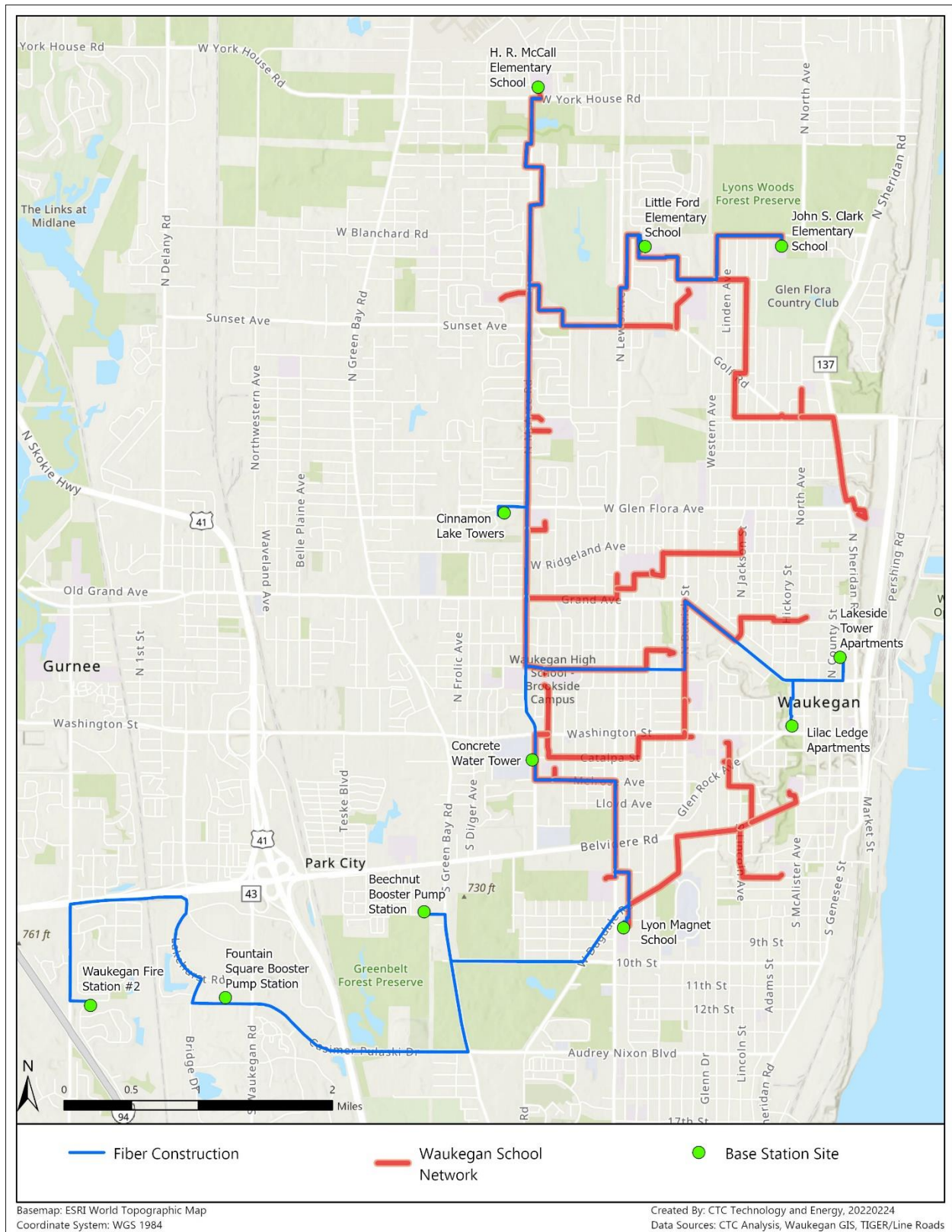
In Model 2, constructing and connecting 17.7 miles of fiber underground in Waukegan would cost $2.3 million to $3.2 million (Table 42) assuming underground construction costs of $125,000 to $175,000 per mile. The map in Figure 76 illustrates the fiber routing corresponding to this estimate.

Table 42: Model 2 capital cost for all new fiber construction (low and high estimates)

Item	Low Estimate	High Estimate
Fiber optic outside plant (OSP) construction	$2,212,500	$3,097,500
Network hardware	$55,000	$55,000
Network integration and testing	$13,750	$13,750
Core switch	$25,000	$25,000
Total capital costs	**$2,281,250**	**$3,166,250**

Figure 76: Routing of dedicated fiber network to base station sites (Model 2)
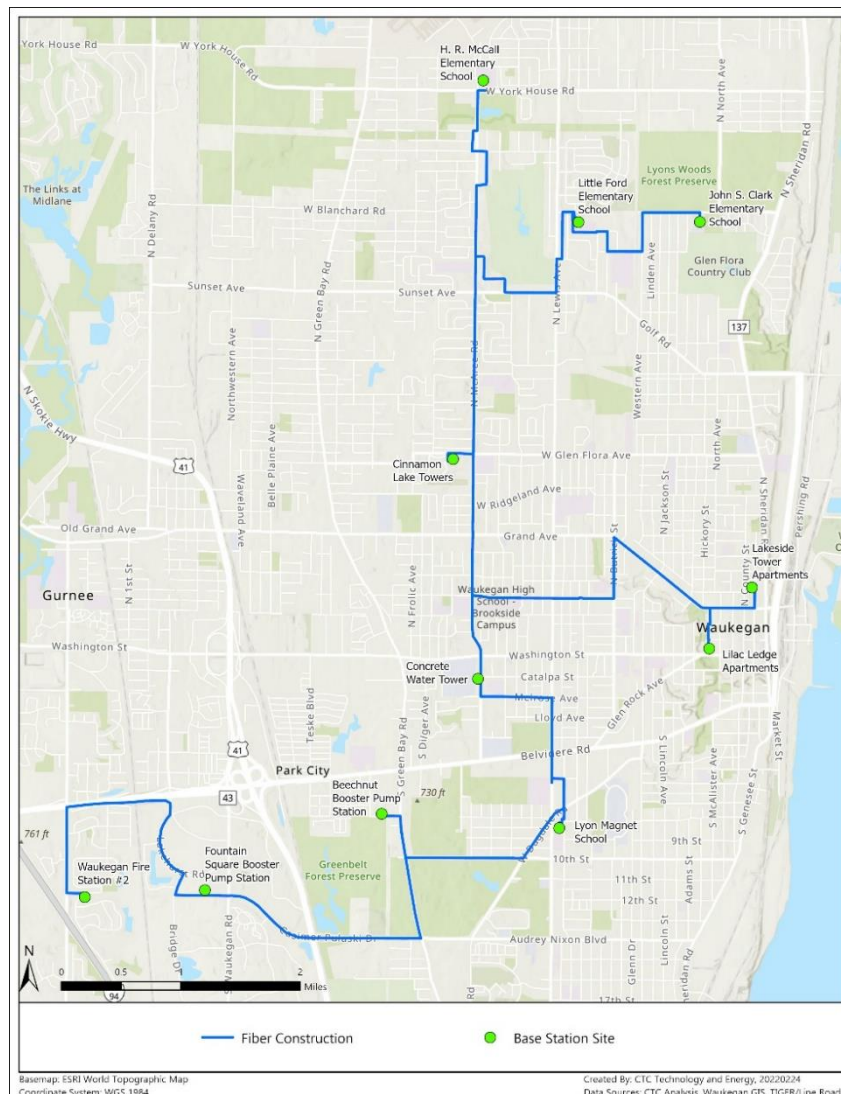
8.2.3.3 Capital costs for wireless base stations and CPE

The distribution network for Model 1 or Model 2 is estimated to cost approximately $700,000, including the core network, access point equipment for CBRS operation at 11 sites, installation, engineering, and project management.

Core networking equipment would need to be installed, configured, and maintained for the CBRS LTE. This equipment is typically vendor-specific and would likely need at least two racks in a data center. This can be set up in a redundant manner at two data centers. We assume approximately $35,000 for core equipment, installation, engineering, and project management.

Installation costs are estimated to be $30,000 for each base station site and engineering and project management is estimated at 10 percent of the total equipment costs.

CPE will cost an estimated $1.1 million, assuming an even distribution among the three different types described in section 2.3 and costs of $275 to $675 per unit (depending on type).

Table 43 details the costs of the distribution equipment, with and without CPE, at approximately 2,000 serviceable addresses. The approximate average cost per address served is $900.

Table 43: Estimated capital costs for fixed wireless base stations and CPE (Model 1 and Model 2)

Addresses Served by Broadband	Capital Cost without CPE	Capital Cost with CPE	Capital Cost per Address Served
2,046	$691,974	$1,805,018	$882

8.2.3.4 Operating costs

The five-year operating costs for the network (including wireless equipment and fiber) are estimated to be $4.9 million to $5.1 million, depending on the fiber construction scenario (i.e., Model 1 or Model 2). Using the same assumptions, the estimated 10-year operating costs are approximately $10.3 million to $10.9 million (see Table 38, above).

Operating cost estimates assume a 2.5 percent annual cost-of-living increase, and that all sites are built at the same time, thus reducing both capital costs and several categories of operating costs.

Operating cost estimates include fees paid to access the CBRS spectrum allocation system; regular maintenance (at 20 percent of the capital equipment costs, including maintenance agreements with suppliers and any adds, moves, and changes required); and regular replacement of the CPE and the distribution equipment at the base station sites and core.[63] Electronics will be replaced at six-year intervals due both to technological obsolescence and wear and tear—and

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[63] Electronics replacement costs are amortized annually in the model.

unlike a fiber network, the electronics comprise almost all the capital cost of the network, thus significantly increasing the network's ongoing cost.

The required fiber connections would also require maintenance and operations. For the full fiber construction (Model 2), we estimate those costs at approximately $200,000 per year, including approximately $100,000 for fiber maintenance, repair, and locates, and approximately $100,000 for staffing, network management, network equipment maintenance, and replacement. For the incremental fiber construction that connects to the school fiber (Model 1), we estimate the cost of maintenance and operations to be approximately $150,000 per year, including approximately $75,000 for fiber maintenance, repair, and locates, and approximately $75,000 for staffing, network management, network equipment maintenance, and replacement.

We also considered staffing to operate the network including program and network management, network technician and technician training, help desk/customer service, portal/application/access management, general counsel, and some business administration roles for billing and other duties. Staffing requirements were scaled based on the number of estimated sites and users. The model also includes insurance and minimal office expenses.

The model assumes the use GAA CBRS spectrum, which requires no licensing cost.

8.3 Fixed wireless network design and cost estimates using only school sites and school fiber (Model 3)

We also developed a model using school fiber and base stations at 15 of the 24 school sites. (Nine schools were removed from the design because they were in close proximity to another school; using both locations would result in duplicative coverage and potential interference.)

This model would eliminate the need to build any new fiber but would result in a network that, like Model 1, could only be used by students due to the usage restrictions on WCUSD #60's fiber.

If the number of base station sites were to be reduced in this model—for example, if the WCUSD #60 chose priority locations for the deployment, the cost would be reduced roughly linearly with the reduction in sites.

8.3.1 Base station locations

This model uses the same spectrum and technical considerations and assumptions, including with respect to customer premises equipment, as the Model 1 and Model 2 designs presented in Section 8.2. The access points are listed in Table 44 and mapped in Figure 77.

Table 44: Base station sites – Model 3

Base Station Site	Address
Andrew Cooke Magnet School	522 Belvidere Rd.
Lyon Magnet School	800 S. Elmwood Ave.
John S. Clark Elementary School	601 Blanchard Rd.
Little Ford Elementary School	1775 Blanchard Rd.
Miguel Juarez Middle School	201 N. Butrick St.
Clearview Elementary School	1700 Delaware Rd.
Glenwood Elementary School	2500 Northmoor Ave.
Greenwood Elementary School	1919 North Ave.
H. R. McCall Elementary School	3215 McAree Rd.
Oakdale Elementary School	2230 McAree Rd.
Edith Smith Middle School	930 New York St.
Waukegan High School, Brookside Campus	2325 Brookside Ave.
Carman-Buckner Elementary School	520 Helmholz St.
Glen Flora Elementary School	1110 Chestnut St.
North Elementary School	410 Franklin St.

Figure 77: Map of base station sites – Model 3
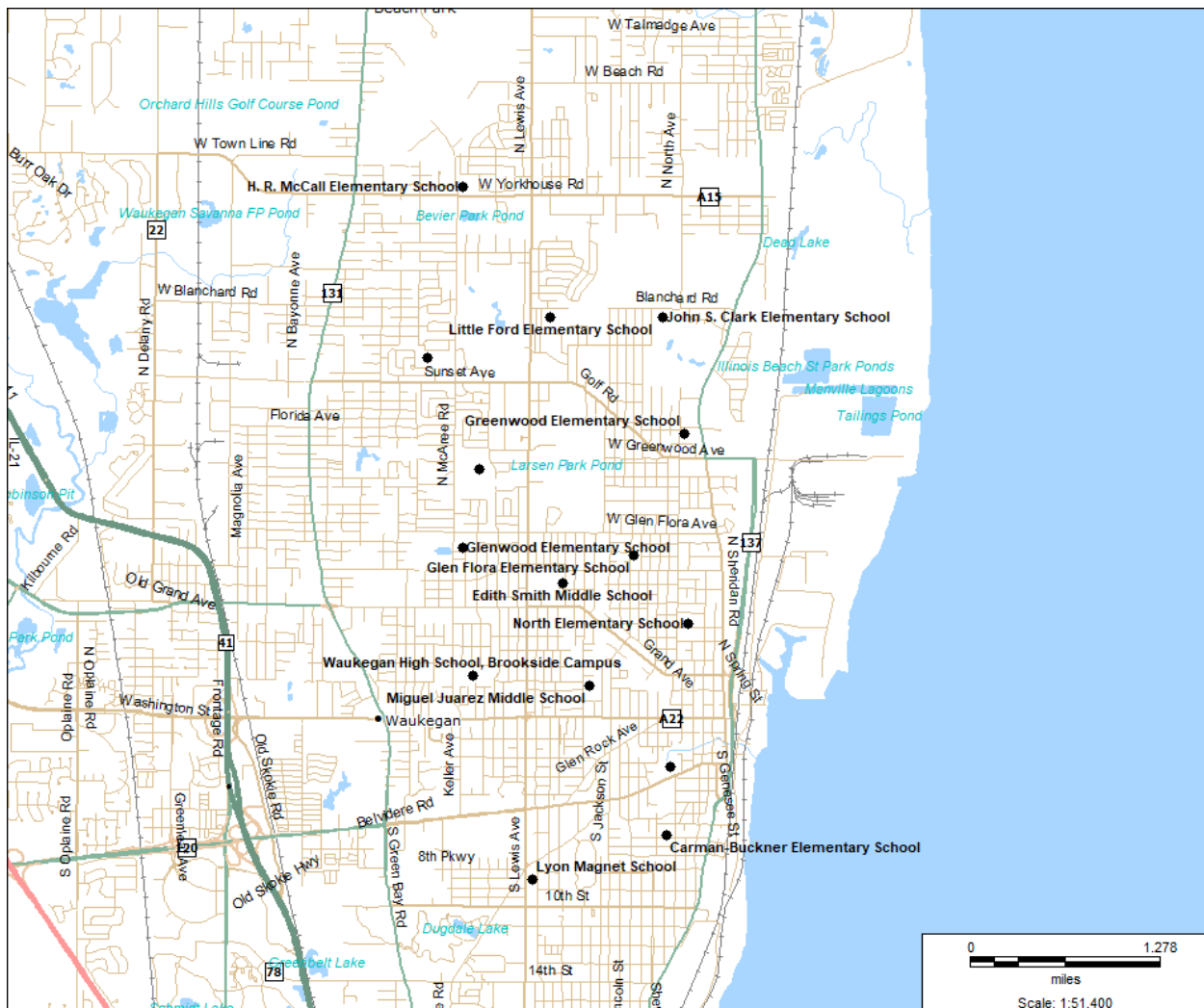
8.3.2 Coverage area

Using the same propagation model and assumptions as for Model 1 and Model 2, we estimated the coverage range for Model 3 (Figure 78). While this model could deliver service to more households than Model 1 or Model 2 (i.e., 2,800 vs. 2,000), the geographic coverage possible from base stations at these 15 schools would be about 35 percent less than from the sites used in Model 1 and 2; the coverage loss is because Model 1 and Model 2 had several sites that had significant height advantages over the schools in this model.

Figure 78: Approximate fixed wireless network coverage map – Model 3
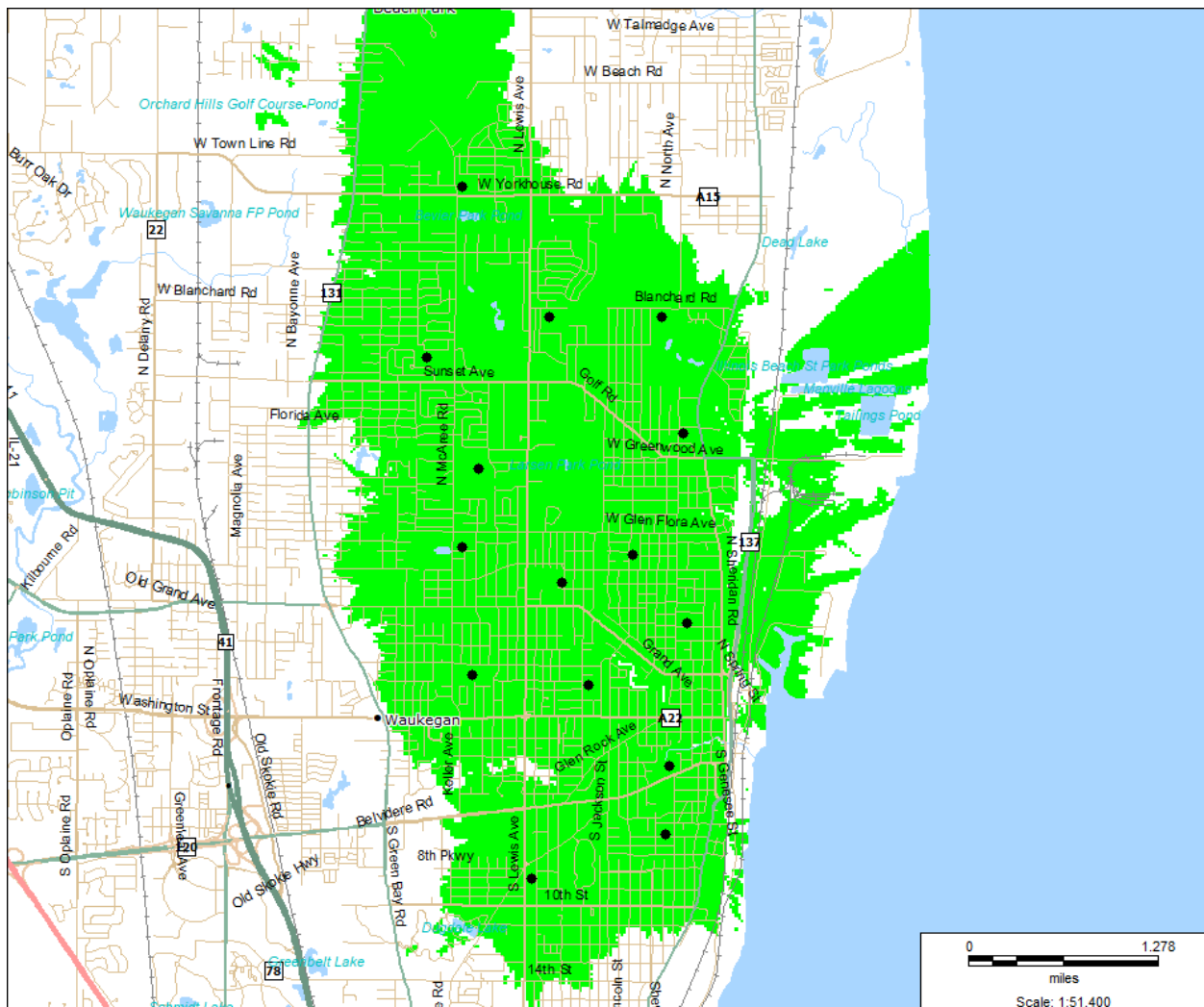
8.3.3   Estimated capital costs for wireless base stations and CPE

The distribution network for Model 3 is estimated to cost approximately $930,000 including the core network, access point equipment for CBRS operation at 15 sites, installation, engineering, and project management.

Core networking equipment would need to be installed, configured, and maintained for the CBRS LTE. This equipment is typically vendor-specific and would likely need at least two racks in a data center. This can be set up in a redundant manner at two data centers. We assume approximately $35,000 for core equipment, installation, engineering, and project management.

Installation costs are estimated to be $30,000 for each base station site; engineering and project management is estimated at 10 percent of the total equipment costs.

CPE will cost an estimated $1.5 million, assuming an even distribution among the three different types described in Section 2.3 and costs of $275 to $675 per unit (depending on type).

Table 45 details the costs of the distribution equipment, with and without CPE, at approximately 2,790 serviceable addresses. The approximate average cost per address served is $877.

Table 45: Estimated capital costs for fixed wireless base stations and CPE (Model 3)

Addresses Served by Broadband	Capital Cost without CPE	Capital Cost with CPE	Capital Cost per Address Served
2,790	$930,000	$2.4 million	$877

8.3.4 Estimated operating costs

The five-year operating costs for the network (including wireless equipment, but with no requirement for fiber) are estimated to be $5.2 million. Using the same assumptions, the estimated 10-year operating costs are approximately $11.1 million (Table 463). These estimates assume that the equipment has a five-year life and is refreshed (replaced) at year 6, so the equipment replacement cost is included in the 10-year costs.

Table 46: Estimated operating expenses for Model 3 fixed wireless network

Addresses Served by Broadband	5 Year Operational Costs	5 Year Operational Costs per Address	10 Year Operational Costs	10 Year Operational Costs per Address
2,790	$5.2 million	$1,868	$11.1 million	$3,982

Operating cost estimates assume a 2.5 percent annual cost-of-living increase, and that all sites are built at the same time, thus reducing capital costs and several categories of operating costs. Operating cost estimates include fees paid to access the CBRS spectrum allocation system; regular maintenance (at 20 percent of the capital equipment costs, including maintenance agreements with suppliers and any adds, moves, and changes required); and regular replacement of the CPE and the distribution equipment at the base station sites and core.[64]

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[64] Electronics replacement costs are amortized annually in the model.

Appendix A: CTC's information requests as sent to the Waukegan Community Broadband Taskforce

Non-engineering

<div align="center">

Waukegan Community Broadband Taskforce
Information Request – non-engineering
Sept. 13, 2021

</div>

Following is a list of information, data, and other materials—all of a non-engineering nature—that would be useful for our study. The goal of these questions is to ensure that CTC obtain as much data as may already have been developed about the broadband-related problems faced by the Waukegan community and of the nature and extent of existing efforts to solve those problems. (A second request will list items of an engineering nature and is specifically relevant to the design, cost estimation, and eventual deployment of wired or wireless communications networks.)

If any of the requested information will require a substantial effort, we can discuss why we are requesting this data, and look at alternative sources.

1. Any data Waukegan stakeholders – including school departments, libraries, human service agencies, nonprofits, or others—may possess pertaining to gaps Waukegan residents face with respect to broadband affordability, devices, and skills. For example:
   a. Number of Waukegan residents eligible for public assistance programs such as the National School Lunch Program, Housing Assistance, Medicaid, SNAP, and SSI. We anticipate that school officials and County or City agencies will possess this information.
   b. Number of families receiving Comcast Internet Essentials or other low-cost broadband services (if any) at the present time, if known.
   c. Any documentation or estimates on problems or gaps in obtaining low-cost broadband services by eligible families.
   d. Numbers of mobile hotspots, Chromebooks, or other equipment made available to local residents by libraries, schools, City or other public agencies, nonprofits, or other entities.
   e. Any data or estimates developed by stakeholders describing remaining gaps in the provisions of such equipment to local residents.
   f. Any information about the existence of digital skills training programs and participation in such programs by Waukegan residents. Such programs could be public, private, or nonprofit.
   g. Any available data that estimates the excess demand for such programs or the magnitude of skills gaps in Waukegan
   h. Any other documentation that sheds further light on the magnitude of problems Waukegan residents are having around affordability, device access, or broadband/computer skills.

2. Copies of any previous studies, surveys, or other relevant reports developed by ConnectWaukegan or by stakeholders with whom ConnectWaukegan is in contact.
3. List of known broadband services (availability and gaps)
4. Agreements—and any discussion summaries of any meetings—with internet providers with respect to filling any identified gaps in service, affordability, or usage of Internet Essentials, etc.
5. Any agreements or memoranda of understanding regarding the City's plans for public-private collaboration in broadband
6. Any information about funding from the state associated with broadband
7. Any other information you deem relevant

Engineering

Waukegan Community Broadband Taskforce
Engineering-related information request
Sept 13, 2021

Following is a list of information, data, and materials for the engineering portion of the study. When we get to the point where we are designing a network and providing a cost estimate, we will need these kinds of data to provide you with the most accurate information. If any of the requests will require a substantial effort, we can discuss why we are requesting this data, and look at alternative sources. When possible and where relevant, please provide data as GIS-based maps and coordinates.

1. Map and list of City-owned facilities in Waukegan.
2. Map and list of City-owned vertical assets
    a. Public safety radio towers (could be County- or other publicly owned towers)
    b. Water towers
    c. Government building rooftops (could be County or other public buildings)
3. Does the City have any priorities for fiber connections, such as:
    a. City departments and facilities
    b. External groups or organizations (e.g., Public Schools, City & County buildings, and facilities)
    c. Business parks
    d. Unserved areas
    e. Any other—please describe
4. GIS Information
    a. City facilities
        i. Anchor/government facilities
        ii. Recreational facilities
        iii. Community centers
        iv. Others
    b. Areas of interest boundaries such as
        i. Historic Districts
        ii. Business Districts
        iii. Other
    c. Existing conduit and fiber (City, County or State)
    d. Existing assets
        i. Huts
        ii. Public safety radio towers
        iii. Water towers
    e. Any other utility information

f. Parcels
g. Address points
h. Building information
i. Street Polygons
j. Right of Way data
k. Sidewalk/Parking Lot Polygons

5. Permitting in City
   a. Responsible agencies
   b. Processes for permitting
   c. Rules on cabinets/pedestals
   d. Easements
   e. Depth
   f. Placement of utilities
   g. Restoration
   h. Timelines
   i. Microtrenching
   j. Moratorium/dig once/joint trench coordination rules or ordinances (if any)
   k. City/County/State roads
   l. Wireless Siting
      i. Small wireless facilities (SWF)
      ii. Monopole/tower siting
      iii. Height restrictions
      iv. SWF franchise agreements
      v. Tower lease agreements for County owned vertical assets
6. Overview of City rights-of-way
   a. Utility pole owners
      i. Is the City currently on any utility poles
      ii. Copies of any pole attachment agreements
      iii. Process for attaching to poles
   b. Aerial
      i. Front/rear
      ii. Pole congestion
      iii. Number of wired and wireless entities typically attached
   c. Underground
      i. Typical easements (sidewalk, parkway, road)
7. Any agreements for the sharing of fiber or wireless siting facilities
8. Any information on building owner contracts with telecommunication providers
9. Any information on providers that provide services through a Condo or Homeowners Association.
10. (As requested in the other document): Any agreements or memoranda of understanding regarding the City's plans for public-private collaboration in broadband
11. (This request is not absolutely critical – we know rates are low): What was the latest bond or loan issuance by the County?

a. When was the bond issued? What amount?
b. What was the estimated issuance cost?
c. What was the term (years)?
d. What was the rate?
e. Was a debt service reserve required? If so, what was the percentage?
f. What is the average rate of outstanding bonds?

Appendix B: Survey instruments

English survey

Internet Usage Survey

November 2021

ConnectWaukegan is a nonprofit group founded with the mission to ensure residents of Waukegan have equal access to internet services.

Even if you do not have home internet service—or don't use the internet often—please complete this survey and return in the enclosed postage-paid envelope by November 22. Your input will help us make sure that we put together a plan that helps everyone in the community.

The information gathered will not be used to sell you anything. Your responses will be kept confidential and no one will know who responded.

If you have questions about this survey, or need assistance in another language, please contact Peggy Talbot, Connect Waukegan volunteer, at 847-372-5406.

Your opinions and information are important to us!

ConnectWaukegan is an initiative of the Waukegan Community Broadband Taskforce: a group of public and private organizations working together to make sure all residents have equal access to the internet. These are the groups currently working together, others will be joining soon. Thank you for supporting our efforts!

1. **Do you ever use the internet from any location?**

   ☐1 Yes **(Please <u>skip</u> to Question 3)**
   ☐2 No

2. **Thinking about why you do NOT use the internet, please indicate how much you agree or disagree with the following reasons**
   (please circle your response for each statement, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)

Aspect	Strongly Disagree				Strongly Agree
(a) An internet connection is too expensive.	1	2	3	4	5
(b) I am concerned about my safety and privacy.	1	2	3	4	5
(c) I don't see the value of the internet / I am not interested.	1	2	3	4	5
(d) Internet service is not available where I live.	1	2	3	4	5
(e) I don't need to go online because I have someone who will do it for me.	1	2	3	4	5
(f) I have no one to teach me how to go online.	1	2	3	4	5
(g) I do not know English well enough to use the internet.	1	2	3	4	5
(h) Using the internet is too difficult.	1	2	3	4	5

3. **What internet access devices are available for use in your home? Check all that apply, but only for devices that are in good working order.**

   ☐1 Desktop computer
   ☐2 Laptop
   ☐3 Tablet computer (for example, an iPad)
   ☐4 Mobile phone with internet access (for example, iPhone or Samsung Galaxy)
   ☐5 Console game (for example, an Xbox or Playstation)
   ☐6 Chromebook issued by the Waukegan schools **(if this is your only computer, please <u>skip</u> to Question 5)**
   ☐7 I do not have any computing devices in my home that are in good working order **(Please <u>skip</u> to Question 5)**

4. **Thinking about the computer you primarily use (other than a school-issued Chromebook), if it were lost or damaged, how long do you think it would take you to replace it?**

   ☐1 I could not do so in the foreseeable future   ☐4 About one week
   ☐2 1-6 months   ☐5 About one day
   ☐3 2-4 weeks

5. **Who is your primary internet service provider at home?** *(✓ only one)*

   ☐1 Do not have internet service (home internet or cellular/mobile) **(Please <u>answer</u> Question 6 and then <u>skip</u> to Question 15)**
   ☐2 Comcast **(Please <u>answer</u> Question 7)**
   ☐3 AT&T– wired service **(Please <u>answer</u> Question 8)**
   ☐4 Mobile hotspot issued by the Waukegan schools or other organization; I am not sure of the internet service provider
   ☐5 E-Vergent (fixed wireless service)
   ☐6 HughesNet (satellite service)
   ☐7 Viasat (satellite service)
   ☐8 MetroPCS (mobile service)
   ☐9 AT&T (mobile service)
   ☐10 Verizon wireless (mobile service)
   ☐11 T-Mobile (mobile service)
   ☐12 Other (Please specify:_____)

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6. **If you do not have home internet service other than through your mobile phone, what is your <u>main</u> reason for not purchasing home internet service?** *(✔only one)*

1 Cellular/mobile data service meets my needs
2 No internet-enabled devices in our home
3 Do not see value/no interest or need for the internet
4 Can get internet access at another location
5 Privacy and security concerns
6 The cost of internet service is too high
7 Don't know how to use the internet
8 Adequate internet service is not available at our location
9 Other _____

7. **If you are a Comcast customer, are you enrolled in Internet Essentials, which provides $9.95 home internet service?**

1 Yes
2 No
3 I had not heard of this program until now
4 I attempted to enroll in this program but was declined
5 I am not a Comcast customer

8. **If your home internet service provider is AT&T, are you enrolled in "Access from AT&T," which provides $10 home internet service?** *(✔only one)*

1 Yes
2 No
3 I had not heard of this program until now
4 I attempted to enroll in this program but was declined
5 I am not an AT&T customer

9. **Do you receive a $9.25 subsidy on either a wireline or wireless broadband service under the FCC's "Lifeline" program?**

1 Yes
2 No
3 I had not heard of this program until now
4 I attempted to enroll in this program but was declined

10. **Please estimate how much your household pays PER MONTH for your <u>home</u> internet service (not including television or phone service).**

1 $0 to $10   5 $61 to $80
2 $11 to $20   6 $81 to $100
3 $21 to $40   7 $101 to $120
4 $41 to $60   8 More than $120

2

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11. How often do you and anyone in your household use your primary home internet connection for: *(please circle your response for each activity, where 1=Never, 2=Occasionally, and 3=Frequently)*

Home Internet Activity	Never	Occasionally	Frequently
(a) Connecting to work	1	2	3
(b) Using social media	1	2	3
(c) Shopping online	1	2	3
(d) Running a home business	1	2	3
(e) Attending school/classes or doing homework.	1	2	3
(f) Accessing government information	1	2	3
(g) Accessing medical services	1	2	3
(h) Banking or paying bills	1	2	3
(i) Accessing home security/other "smart home" devices	1	2	3
(j) Listening to music	1	2	3
(k) Watching movies/videos	1	2	3
(l) Playing online games	1	2	3

12. What is the largest number of people in your home who ever need to use the internet <u>at the same time</u>?

- 1 1
- 2 2
- 3 3
- 4 4
- 5 5 or more

13. How important are the following aspects of your primary <u>*home*</u> internet service? *(please circle your response for each aspect, where 1=Not at all important, 2=Slightly important, 3=Moderately important, 4=Very important, 5=Extremely important)*

Aspect	Not at all important				Extremely important
(a) Speed	1	2	3	4	5
(b) Reliability	1	2	3	4	5
(c) Cost	1	2	3	4	5
(d) Customer service	1	2	3	4	5

14. How satisfied are you with the following aspects of your primary <u>*home*</u> internet service? *(please circle your response for each aspect, where 1=Not at all satisfied, 2=Slightly satisfied, 3=Moderately satisfied, 4=Very satisfied, 5=Extremely satisfied)*

Aspect	Not at all Satisfied				Extremely Satisfied
(a) Speed	1	2	3	4	5
(b) Reliability	1	2	3	4	5
(c) Cost	1	2	3	4	5
(d) Customer service	1	2	3	4	5

15. **How often do you use the internet in the following locations on average?** *(please circle your response for each timeframe, where 1=Never, 2=Less Than Monthly, 3=Monthly, 4=Weekly, 5=Daily)*

Location	Never	Less Than Monthly	Monthly	Weekly	Daily
(a) At my home	1	2	3	4	5
(b) At the home of a friend or family member	1	2	3	4	5
(c) At work	1	2	3	4	5
(d) Inside a school or a college/university building	1	2	3	4	5
(e) Inside a coffee shop or other private business	1	2	3	4	5
(f) Inside a library	1	2	3	4	5
(g) Inside other public buildings such as a municipal office or senior center	1	2	3	4	5
(h) At any outdoor public spaces (including outside any of the above locations) using free Wi-Fi	1	2	3	4	5

16. **Please indicate how much you disagree or agree with the following statements regarding your skills using computers and the internet.** *(please circle your response for each statement, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)*

Skill	Strongly Disagree				Strongly Agree
(a) I know how to access a website and search for information online	1	2	3	4	5
(b) I have an email address and know how to use it.	1	2	3	4	5
(c) I know how to adjust my privacy settings online, such as on Facebook.	1	2	3	4	5
(d) I know how to use the internet to see my student's grades, work assignments, or other school communications.	1	2	3	4	5
(e) I know how to connect with my doctor or view my medical test results / records online.	1	2	3	4	5
(f) I know how to access my bank account online to pay bills or depositing checks.	1	2	3	4	5
(g) I know how to purchase groceries online.	1	2	3	4	5
(h) I know how to create and manage my own personal website.	1	2	3	4	5
(i) I know how to recognize and avoid a phishing scam.	1	2	3	4	5
(j) I know how to identify false or misleading information online and find credible sources of information.	1	2	3	4	5

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17. **Please indicate how much you disagree or agree with the following statements about your interest in learning more about how to use computers and the internet.** *(please circle your response for each statement, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)*

Statement	Strongly Disagree				Strongly Agree
(a) I would like to become more confident in using computers, mobile phones, and the internet.	1	2	3	4	5
(b) I would attend a free or inexpensive class to gain such confidence.	1	2	3	4	5
(c) I would like to learn how to better find trustworthy information on the internet.	1	2	3	4	5
(d) I would attend a free or inexpensive class to learn how to find trustworthy information on the internet	1	2	3	4	5
(e) I would like to learn how computers work.	1	2	3	4	5
(f) I would attend a free or inexpensive class to learn how computers work.	1	2	3	4	5
(g) I would like to know how to write software or "code"	1	2	3	4	4
(h) I would attend a free or inexpensive class to learn how to write software or "code."	1	2	3	4	5

18. **Does your job require you to have internet access at your home?**

   1 Yes
   2 No
   3 Does not apply: Retired or not employed at this time

19. **Are you or is any member of your household currently working remotely using computers and the internet (often known as teleworking), or interested in doing so?**

   1 Someone in my household currently does telework from home
   2 Someone in my household would like to telework
   3 No

20. **Does someone in your household have a home-based business or plan to start a home-based business in the next three years?**

   1 Yes, I/we already have a home-based business
   2 Yes, I/we plan to start one in next three years
   3 No

21. **How important is high-speed internet access at your home for:** *(please circle your response for each aspect, where 1=Not at all important, 2=Slightly important, 3=Moderately important, 4=Very important, 5=Extremely important)*

Aspect	Not at All Important				Extremely Important	N/A
(a) Working from home	1	2	3	4	5	6
(b) Planned/existing home-based business	1	2	3	4	5	6

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22. **Does a member of your household use the internet connection for remote school, homework, or other educational purposes?**

    1️⃣ Yes
    2️⃣ No **(Please skip to Question 25)**

23. **For what education level is your internet connection used?** *(✓all that apply for members of your household)*

    1️⃣ Early Childhood (Preschool, 3K, 4K)
    2️⃣ Primary (Grades 5k – 8)
    3️⃣ Secondary (Grades 9 – 12)
    4️⃣ Post-Secondary (Technical/vocational training, college, etc.)
    5️⃣ Graduate (Graduate, post-graduate, professional degree)
    6️⃣ Continuing or Adult Education/Professional Development
    7️⃣ Other _____

24. **How important is a high-speed internet connection at your home for the educational needs of your household?**

    1️⃣ Not at all important
    2️⃣ Slightly important
    3️⃣ Moderately important
    4️⃣ Very important
    5️⃣ Extremely important

25. **Are you the parent, legal guardian or primary caregiver for any child or grandchild under the age of 18 (minor child)?**

    1️⃣ Yes
    2️⃣ No **(Please skip to Question 27)**

26. **This next set of questions asks about the internet skills of children under your care. If you are a legal guardian of a minor child in school, these questions apply to you.** *(please circle your response for each statement, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)*

Risk	Strongly Disagree				Strongly Agree
(a) I feel that in general, my children or grandchildren use the internet in positive and beneficial ways.	1	2	3	4	5
(b) I feel that my children or grandchildren have the skills to detect and avoid false or misleading information online.	1	2	3	4	5
(c) I feel that my children or grandchildren under my care are able to complete their homework using internet connetions and devices available in our home.	1	2	3	4	5
(d) I feel that my children or grandchildren are able to avoid bullying on the internet by peers.	1	2	3	4	5
(e) I feel that my children or grandchildren are able to avoid exposure to graphic violence or pornography online.	1	2	3	4	5

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INFORMATION ABOUT YOU

Your answers to the following questions will be used to describe survey respondents as a whole. Your individual information will be kept confidential.

27. Which of the following best describes your age?

- ☐1 18 to 34 years
- ☐2 35 to 44 years
- ☐3 45 to 54 years
- ☐4 55 to 64 years
- ☐5 65 years and older

28. What is the highest level of education you have completed?

- ☐1 Grade School
- ☐2 Some high school
- ☐3 Completed high school
- ☐4 Two-year college or technical degree
- ☐5 Four-year college degree
- ☐6 Graduate, professional, or doctorate degree

29. What is your approximate annual <u>household</u> income?

- ☐1 Less than $25,000
- ☐2 $25,000 to $49,999
- ☐3 $50,000 to $74,999
- ☐4 $75,000 to $99,999
- ☐5 $100,000 to $149,999
- ☐6 More than $150,000
- ☐7 Prefer not to answer

30. How do you identify your race/ethnicity? (✓*all that apply*)

- ☐1 Black/African American
- ☐2 Eastern Asian/Asian American
- ☐3 Hispanic/Latino
- ☐4 Native American/Indigenous American
- ☐5 Southern Asian/Indian American
- ☐6 Western Asian/Arab American
- ☐7 White/European American
- ☐8 Other (please specify): _____

31. How many people reside in your home (adults and children)?

<u>Adults (including yourself)</u>

- ☐1 1
- ☐2 2
- ☐3 3
- ☐4 4 or more

<u>Children age 18 and younger</u>

- ☐0 None
- ☐1 1
- ☐2 2
- ☐3 3
- ☐4 4 or more

32. Do you own or rent your residence?

- ☐1 Own
- ☐2 Rent
- ☐3 Live with family
- ☐4 Other: _____

Thank you for completing this survey!

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Spanish survey

Encuesta sobre el uso de Internet

Noviembre de 2021

ConnectWaukegan es un grupo sin fines de lucro creado con la misión de asegurar que los residentes de Waukegan tengan igualdad de acceso a los servicios de Internet.

Aunque usted no tenga servicio de Internet en casa, o no usa el Internet con frecuencia, complete esta encuesta y devuélvala en el sobre adjunto que incluye estampilla a más tardar el 22 de noviembre. Su opinión nos ayudará a asegurarnos de que hagamos un plan que ayude a todos los miembros de la comunidad.

La información recolectada no se usará para venderle ningún producto. Sus respuestas se mantendrán confidenciales y nadie sabrá quién respondió.

Si tiene preguntas sobre esta encuesta o necesita ayuda en otro idioma, póngase en contacto con Isabel Gallegos, voluntaria de ConnectWaukegan, al 847-599-2510.

¡Sus opiniones e información son importantes para nosotros!

ConnectWaukegan es una iniciativa de Waukegan Community Broadband Taskforce: un grupo de organizaciones públicas y privadas que colaboran para que todos los residentes tengan el mismo acceso a Internet. Estos son los grupos actualmente que están participando, pronto habrá más que participarán. ¡Gracias por apoyar nuestros esfuerzos!

1. **¿Usa Internet desde cualquier lugar?**

   1️⃣ **Sí (si su respuesta es sí, <u>pase</u> a la Pregunta 3)**

   2️⃣ No

2. **Pensando en sus motivos por los que NO utiliza Internet, indique en qué medida está de acuerdo o en desacuerdo con las siguientes razones** *(marque en círculo cada afirmación, donde 1=Totalmente en desacuerdo, 2=En desacuerdo, 3=Neutral, 4=De acuerdo, 5=Totalmente de acuerdo)*

Aspecto	Totalmente en desacuerdo				Totalmente de acuerdo
(a) Una conexión de Internet es muy cara.	1	2	3	4	5
(b) Me preocupa mi seguridad y privacidad.	1	2	3	4	5
(c) No veo el valor de Internet / no me interesa.	1	2	3	4	5
(d) No hay servicio de Internet donde vivo.	1	2	3	4	5
(e) No necesito conectarme a Internet porque tengo a alguien que lo hará por mí.	1	2	3	4	5
(f) No tengo a nadie que me enseñe a conectarme.	1	2	3	4	5
(g) No sé lo suficientemente inglés como para usar Internet.	1	2	3	4	5
(h) Es muy difícil usar Internet.	1	2	3	4	5

3. **¿Qué dispositivos de acceso a Internet están disponibles para su uso en el hogar? Marque todo lo que corresponda, pero solo para los dispositivos que estén en buen estado de funcionamiento.**

   1️⃣ Computadora de escritorio

   2️⃣ Computadora portátil

   3️⃣ Tableta (por ejemplo, un iPad)

   4️⃣ Celular con acceso a Internet (por ejemplo, iPhone o Samsung Galaxy)

   5️⃣ Juego de consola (por ejemplo, un Xbox o Playstation)

   6️⃣ Chromebook otorgado por las escuelas de Waukegan **(si esta es su única computadora, <u>pase</u> a la Pregunta 5)**

   7️⃣ No tengo ningún dispositivo de computadora personal en mi casa que esté funcionando bien
   (si esta es su respuesta, <u>pase</u> a la Pregunta 5)

4. **Piense en la computadora que utiliza principalmente (fuera de la Chromebook de la escuela); si se perdiera o se dañara sin posibilidad de reparación, ¿cuánto tiempo cree que tardaría en reemplazarla?**

   1️⃣ No podría hacerlo en un futuro próximo

   2️⃣ 1 a 6 meses

   3️⃣ 2 a 4 semanas

   4️⃣ Aproximadamente una semana

   5️⃣ Aproximadamente un día

5. **¿Quién es su proveedor de servicio primario de Internet?** *(marque solo una)*

   1️⃣ No tengo servicio de Internet (Internet en casa o móvil) **(<u>responda la</u> Pregunta 6 y luego, <u>pase</u> a la Pregunta 15)**

   2️⃣ Comcast **(<u>responda</u> la Pregunta 7)**

   3️⃣ AT&T– servicio alámbrico **(<u>responda</u> la Pregunta 8)**

   4️⃣ Hotspot móvil otorgado por las escuelas de Waukegan u otra organización; No estoy seguro del proveedor de Internet

   5️⃣ E-Vergent (servicio fijo inalámbrico)

   6️⃣ HughesNet (servicio de satélite)

   7️⃣ Viasat (servicio de satélite)

   8️⃣ MetroPCS (servicio móvil)

   9️⃣ AT&T (servicio móvil)

   🔟 Verizon wireless (servicio móvil)

   1️⃣1️⃣ T-Mobile (servicio móvil)

   1️⃣2️⃣ Otro (especifique: _____)

1

6. **Si no tiene servicio de Internet en casa, aparte de su celular, ¿cuál es su razón <u>principal</u> por no comprar servicio de Internet para la casa?** (✔*solo una*)

   ☐1 El servicio de datos del celular/móvil satisface mis necesidades
   ☐2 No hay dispositivos con Internet en nuestra casa
   ☐3 No veo el valor/ no tengo interés o necesidad de Internet
   ☐4 Puedo obtener acceso a Internet en otro lugar
   ☐5 Preocupación por la privacidad y la seguridad
   ☐6 El costo del servicio de Internet es demasiado alto
   ☐7 No sabemos cómo utilizar Internet
   ☐8 No se dispone de un servicio de Internet adecuado en nuestra ubicación
   ☐9 Otro _____

7. **¿Si es un cliente de Comcast, ¿está inscrito en Internet Essentials, que ofrece $9.95 de servicio de Internet en casa?** (✔*solo una*)

   ☐1 Sí
   ☐2 No
   ☐3 No he escuchado de este programa antes
   ☐4 Intenté inscribirme, pero me lo negaron
   ☐5 No soy cliente de Comcast

8. **¿Si su proveedor de servicio de Internet en casa es AT&T, ¿está inscrito en "Access from AT&T", que ofrece $10 de servicio de Internet en casa?** (✔*solo una*)

   ☐1 Sí
   ☐2 No
   ☐3 No he escuchado de este programa antes
   ☐4 Intenté inscribirme, pero me lo negaron
   ☐5 No soy cliente de AT&T

9. **¿Recibe un subsidio de $9.25 en un servicio de banda ancha alámbrico o inalámbrico en el marco del programa "Lifeline" de la FCC?** (✔*solo una*)

   ☐1 Sí
   ☐2 No
   ☐3 No he escuchado de este programa antes
   ☐4 Intenté inscribirme, pero me lo negaron

10. **¿Cuánto paga su hogar AL MES para su servicio de Internet en <u>*casa*</u> (sin incluir televisión o servicio telefónico)?**

    ☐1 Entre $0 y $10   ☐5 Entre $61 y $80
    ☐2 Entre $11 y $20   ☐6 Entre $81 y $100
    ☐3 Entre $21 y $40   ☐7 Entre $101 y $120
    ☐4 Entre $41 y $60   ☐8 Más de $120

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11. **Con qué frecuencia usted y otros en su hogar usan su conexión principal de Internet en casa para:** *(marque en círculo su respuesta para cada actividad, donde 1=Nunca, 2=De vez en cuando y 3=Frecuentemente)*

Actividad de Internet en casa	Nunca	De vez en cuando	Frecuentemente
(a) Conectarse al trabajo	1	2	3
(b) Usar redes sociales	1	2	3
(c) Comprar en línea	1	2	3
(d) Llevar un negocio desde casa	1	2	3
(e) Asistir a la escuela/clases o hacer tareas	1	2	3
(f) Obtener acceso a información gubernamental	1	2	3
(g) Obtener acceso a servicios médicos	1	2	3
(h) Hacer banca en línea o pagar facturas/ billes	1	2	3
(i) Obtener acceso a la seguridad del hogar/otros dispositivos de "casa inteligente"	1	2	3
(j) Escuchar música	1	2	3
(k) Ver películas/ videos	1	2	3
(l) Jugar a juegos en línea	1	2	3

12. **¿Cuál es la cantidad más grande de personas en su hogar que necesitan usar Internet <u>al mismo tiempo</u>?**

   1️⃣ 1
   2️⃣ 2
   3️⃣ 3
   4️⃣ 4
   5️⃣ 5 o más

13. **¿Qué tan importantes son los siguientes aspectos de su servicio primario de Internet en el <u>hogar</u>?** *(marque con un círculo su respuesta para cada aspecto, donde 1=Para nada importante, 2=Algo importante, 3=Moderadamente importante, 4=Muy importante, 5=Extremadamente importante)*

Aspecto	Para nada importante				Extremadamente importante
(a) Velocidad	1	2	3	4	5
(b) Confiabilidad	1	2	3	4	5
(c) Costo	1	2	3	4	5
(d) Servicio al cliente	1	2	3	4	5

14. **¿Qué tan satisfecho está con los siguientes aspectos de su servicio primario de Internet en el <u>hogar</u>?** *(marque con un círculo su respuesta para cada aspecto, donde 1=Para nada satisfecho, 2=Algo satisfecho, 3=Moderadamente satisfecho, 4=Muy satisfecho, 5=Extremadamente satisfecho)*

Aspecto	Para nada Satisfecho				Extremadamente Satisfecho
(a) Velocidad	1	2	3	4	5
(b) Confiabilidad	1	2	3	4	5
(c) Costo	1	2	3	4	5
(d) Servicio al cliente	1	2	3	4	5

15. **En promedio, ¿con qué frecuencia usa Internet en las siguientes ubicaciones?** *(marque en círculo su respuesta para periodo de tiempo, donde 1=Nunca, 2=Menos de una vez al mes, 3=Mensualmente, 4=Semanalmente, 5=Diariamente)*

Ubicación	Nunca	Menos de una vez al mes	Mensualmente	Semanalmente	Diariamente
(a) En mi hogar	1	2	3	4	5
(b) En casa de un amigo o familiar	1	2	3	4	5
(c) En el trabajo	1	2	3	4	5
(d) Dentro del edificio de una escuela o universidad	1	2	3	4	5
(e) Dentro de una cafetería u otro negocio privado	1	2	3	4	5
(f) Dentro de una biblioteca	1	2	3	4	5
(g) En otros edificios públicos, como una oficina municipal o un centro de ancianos	1	2	3	4	5
(h) En cualquier espacio público al aire libre (incluido el exterior de cualquiera de los lugares mencionados) utilizando el Wi-Fi gratuito	1	2	3	4	5

16. **Indique en qué medida está en desacuerdo o de acuerdo con las siguientes afirmaciones relativas a sus habilidades en el uso de computadoras e Internet.** *(marque en círculo cada afirmación, donde 1=Totalmente en desacuerdo, 2=En desacuerdo, 3=Neutral, 4=De acuerdo, 5=Totalmente de acuerdo)*

Habilidad	*Totalmente en desacuerdo*				*Totalmente de acuerdo*
(a) Sé cómo obtener acceso a un sitio web y hacer búsquedas de información en línea.	1	2	3	4	5
(b) Tengo una dirección de correo electrónico y sé cómo usarla.	1	2	3	4	5
(c) Sé cómo ajustar mi configuración de privacidad en línea, en sitios y redes como en Facebook.	1	2	3	4	5
(d) Sé cómo usar Internet para ver las calificaciones de mi hijo, sus tareas u otras comunicaciones escolares.	1	2	3	4	5
(e) Sé cómo conectarme con mi médico o ver los resultados de mi pruebas médicas / expediente médico en línea.	1	2	3	4	5
(f) Sé cómo acceder a mi cuenta bancaria en línea para pagar facturas o depositar cheques.	1	2	3	4	5
(g) Sé cómo comprar alimentos en línea.	1	2	3	4	5
(h) Sé cómo crear y gestionar mi propio sitio web.	1	2	3	4	5
(i) Sé cómo reconocer y evitar una estafa de phishing.	1	2	3	4	5
(j) Sé identificar la información falsa o engañosa en Internet y encontrar fuentes de información creíbles.	1	2	3	4	5

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17. Indique en qué medida está en desacuerdo o de acuerdo con las siguientes afirmaciones sobre su interés en aprender sobre computadoras e Internet. *(marque en círculo cada afirmación, donde 1=Totalmente en desacuerdo, 2=En desacuerdo, 3=Neutral, 4=De acuerdo, 5=Totalmente de acuerdo)*

Afirmación	Totalmente en desacuerdo				Totalmente de acuerdo
(a) Me gustaría adquirir más confianza en el uso de computadoras, celulares e Internet.	1	2	3	4	5
(b) Asistiría a una clase gratis o económica para tener más experiencia.	1	2	3	4	5
(c) Me gustaría aprender a encontrar mejor la información confiable en Internet.	1	2	3	4	5
(d) Asistiría a una clase gratis o económica sobre cómo encontrar mejor la información fiable en Internet.	1	2	3	4	5
(e) Me gustaría saber cómo funcionan las computadoras.	1	2	3	4	5
(f) Asistiría a una clase gratis o económica sobre cómo funcionan las computadoras.	1	2	3	4	5
(g) Me gustaría saber a escribir software o "código".	1	2	3	4	4
(h) Asistiría a una clase gratis o económica sobre cómo escribir software o "código".	1	2	3	4	5

18. ¿Requiere su trabajo tener acceso a Internet en su hogar?

☐1 Sí

☐2 No

☐3 No corresponde: jubilado o sin empleo en este momento

19. ¿Trabaja usted o algún miembro de su hogar de manera remota utilizando computadoras e Internet (lo que se conoce como teletrabajo), o está interesado en hacerlo?

☐1 Alguien en mi hogar actualmente hace teletrabajo desde casa

☐2 Alguien en mi hogar le gustaría hacer teletrabajo

☐3 No

20. ¿Alguien en su hogar tiene un negocio en casa o planea comenzar un negocio en casa en los próximos tres años?

☐1 Sí, yo/nosotros tengo/tenemos un negocio en casa

☐2 Sí, yo/nosotros planeo/planeamos comenzar uno en los próximos tres años

☐3 No

21. Qué tan importante es la conexión a Internet de alta velocidad en su casa para: *(marque con un círculo su respuesta para cada aspecto, donde 1=Para nada importante, 2=Algo importante, 3=Moderadamente importante, 4=Muy importante, 5=Extremadamente importante)*

Aspecto	Para nada importante				Extremadamente importante	N/A
(a) Trabajar desde casa	1	2	3	4	5	6
(b) Negocio en casa planificado/existente	1	2	3	4	5	6

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22. **¿Usa un miembro de su hogar la conexión de Internet para clases remotas, tareas u otros fines educativos?**

  1 Sí

  2 No (si su respuesta es no, **pase a la Pregunta 25)**

23. **¿Para qué nivel educativo se usa su conexión de Internet?** *(marque todas las que apliquen para miembros de su hogar)*

  1 Primera infancia (preescolar, 3 grado, 4 grado)

  2 Primaria (del 5 al 8 grado)

  3 Secundaria (del 9 al 12 grado)

  4 Después de la secundaria (capacitación técnica/vocacional, universidad, etc.)

  5 Graduado (grado, postgrado, título profesional)

  6 Educación continua o de adultos/desarrollo profesional

  7 Otro _____

24. **¿Qué tan importante es la conexión a Internet de alta velocidad para las necesidades educativas de su hogar?**

  1 Para nada importante

  2 Algo importante

  3 Moderadamente importante

  4 Muy importante

  5 Extremadamente importante

25. **¿Es usted el padre, madre, tutor legal o cuidador primario de un hijo o nieto menor de 18 años (un menor de edad)?**

  1 Sí

  2 No (si su respuesta es no, **pase a la Pregunta 27)**

26. **Este próximo grupo de preguntas se tratan sobre las habilidades con respecto a Internet de los niños que están bajo su cuidado. Si es un tutor legal de un menor de edad que asiste a la escuela, estas preguntas se aplican a usted.** *(marque en círculo cada afirmación, donde 1=Totalmente en desacuerdo, 2=En desacuerdo, 3=Neutral, 4=De acuerdo, 5=Totalmente de acuerdo)*

Riesgo	Totalmente en desacuerdo				Totalmente de acuerdo
(a) Creo que en general, mis hijos o nietos usan Internet de maneras positivas y beneficiosas.	1	2	3	4	5
(b) Creo que mis hijos o nietos tienen la capacidad de detectar y evitar la información falsa o engañosa en Internet.	1	2	3	4	5
(c) Considero que mis hijos o nietos a mi cargo son capaces de completar sus tareas utilizando las conexiones a Internet y los dispositivos disponibles en nuestra casa.	1	2	3	4	5
(d) Creo que mis hijos o nietos pueden evitar el acoso de sus compañeros en Internet.	1	2	3	4	5
(e) Creo que mis hijos o nietos pueden evitar estar expuestos a la violencia gráfica o pornografía en Internet.	1	2	3	4	5

INFORMACIÓN SOBRE USTED

Sus respuestas a las siguientes preguntas describirán al grupo entero de encuestados. Su información personal se mantendrá confidencial.

27. ¿Cuál de los siguientes mejor describe su edad?

1 18 a 34 años
2 35 a 44 años
3 45 a 54 años
4 55 a 64 años
5 65 años en adelante

28. ¿Cuál es el nivel más alto de educación que ha completado?

1 Primaria
2 Secundaria sin terminar
3 Secundaria completa

4 Titulo universitario o técnico de dos años
5 Licenciatura
6 Maestría o doctorado

29. ¿Cuál es su ingreso anual aproximado del <u>hogar</u>?

1 Menos de $25,000
2 Entre $25,000 y $49,999
3 Entre $50,000 y $74,999
4 Entre $75,000 y $99,999

5 Entre $100,000 y $149,999
6 Más de $150,000
7 Prefiero no responder

30. ¿Cómo identifica su raza/etnia? *(Marque todas las que apliquen)*

1 Afroamericano
2 Asiático
3 Hispano/Latino
4 Indígena
5 Asiático meridional/indio americano
6 Asiático occidental/árabe americano
7 Blanco
8 Otro (especifique): _____

31. ¿Cuántas personas viven en su hogar (adultos y niños)?

<u>Adultos (incluso usted)</u>

1 1
2 2
3 3
4 4 o más

<u>Niños menores de 18 años</u>

0 Ninguno
1 1
2 2
3 3
4 4 o más

32. ¿Es dueño o alquila su residencia?

1 Soy dueño
2 Alquilo
3 Vivo con familia
4 Otro: _____

¡Gracias por completar esta encuesta!

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Appendix C: Spreadsheet of non-random survey results

These data have been included as a separate file.

Appendix D: Comcast Internet Essentials Partnership Program agreement (example from another jurisdiction)

Agreement

1. Agreement. This Agreement (the "Agreement") is entered into as
Of ==(Date REQUIRED)== 2021 (the "Effective Date") and is made by and between Comcast Cable Communications Management, LLC ("Comcast") and ==Name REQUIRED==_____("Sponsor") and sets forth the terms and conditions under which Comcast, or its operating Affiliate, will provide Service to certain people that (i) provide Comcast with a unique identifier described in Section 3 below and (ii) Comcast has verified and approved.

2. Definitions:

"Affiliate": means an entity that controls, is controlled by, or is under common control with a party.

"Comcast Equipment": means any and all facilities, equipment, or devices provided by Comcast, or its agents used to deliver the Service, including, but not limited to, cable modems and wiring.

"Comcast Subscriber": means any School End User that (i) Comcast has verified and approved under the terms of this Agreement; (ii) agrees to the terms and conditions required by Comcast to receive Service; and (iii) is receiving Service at the Service Location.

"Comcast Subscriber Information": means any Personally Identifiable Information collected after a School End User becomes a Comcast Subscriber".

"Education Records": means records that are (i) directly related to a student and (ii) maintained by an educational agency or institution or by a party acting for the agency or institution.

"Sponsor End User Application": means a Sponsor End User's application (that contains the unique identifier described in Section 3 below) for the Service that has been approved by Comcast, in its sole discretion.

"Personally Identifiable Information" means: (i) name; (ii) mailing and email address; (iii) personal identifier, such as social security number, student number, or biometric record; (iv) other indirect identifiers, such as date of birth, place of birth, and mother's maiden name; (v) other information that, alone or in combination, is linked or linkable to an individual that would allow a reasonable person in the school community, who does not have personal knowledge of the relevant circumstances, to identify the individual with reasonable certainty; or (vi) information requested by a person who the educational agency or institution reasonably believes knows the identity of the student to whom the education record relates.

"Promotional Period": means that 60-day period, commencing on the Service Commencement Date, for which Sponsor will not be charged the monthly service fee for the Service.

"Sponsor End User": means each family that (i) Sponsor provides with a unique identifier described in Section 3, and (ii) has one or more children residing in the household that are enrolled as a student with Sponsor for the 2020-2021 school year.

"Sponsor Information": means the Personally Identifiable Information of a student or the student's parent or other family member that is (i) contained in the student's Education Records and (ii) provided by Sponsor to Comcast in connection with this Agreement.

"Service": means XFINITY® Internet Essentials service with download speeds of up to 50.0 Mbps and upload speeds of up to 5.0 Mbps.

"Service Commencement Date": means the date when the End User installs the Comcast Equipment and Comcast makes the Service available for use by each End User(s).

"Service Location(s)": means the individual End User(s) residential location(s) to which the Service will be provided by Comcast.

3. Delivery of the Service.

3.1 Codes.   Comcast will provide Sponsor with the number of promotional codes ("Codes") requested by Sponsor and each Code will be unique and one-time use only. Sponsor End Users who receive a Code from Sponsor should either visit www.InternetEssentials.com or call 1-844-963-0178 to apply for the Service. If a Sponsor End User provides Comcast with a Code that Comcast provided to Sponsor, is eligible for Internet Essentials, and agrees to the terms and conditions required by Comcast to receive Service, such Sponsor End User shall become a Comcast Subscriber and Comcast will work with the Comcast Subscriber to get the Service to the Service Location. Comcast will invoice Sponsor for the Comcast Subscribers covered by this Agreement in accordance with Section 4 below. [If the End User already subscribes to the Service, payment obligations for the account will be transferred to the Sponsor for the duration of the Agreement.]

3.2 Additional Fees. Comcast reserves the rights to bill the Comcast Subscriber for any additional fees and charges incurred as a result of the Service that are not specifically set forth in Section 4 of this Agreement, including, but not limited to charges for other Xfinity services, data overage fees, home drop off and installation fees.

4. Billing and Payment.

4.1 Payment.   Comcast will invoice Sponsor on a monthly basis for all charges and fees arising under this Agreement. Except for the Promotional Period where new Comcast Subscribers who have a School End User Application approved by Comcast on or before June 30, 2022 to receive the first two months of Service free, Sponsor shall pay Comcast a monthly recurring charge of $9.95 per month (plus applicable taxes, fees and surcharges) for each Comcast Subscriber(s) that receives Service commencing on the Service Commencement Date. Sponsor shall be billed each month based upon the actual number of Comcast Subscribers, as determined by Comcast prior to the upcoming invoice cycle. Sponsor agrees to pay all undisputed charges and fees within thirty (30) days of the invoice date. Any such undisputed amounts not paid to Comcast within such period will be considered past due.

4.2 Taxes and Fees. Except for taxes based on Comcast's net income, pursuant to this Agreement, Sponsor shall be responsible for the payment and reimbursement to Comcast for of any and all applicable federal, state and local taxes, fees or assessments (however designated) levied upon the sale, installation, use or provision of the Service to the Comcast Subscriber.

4.3 Disputed Invoices. In the event Sponsor disputes charges and fees for the Service, Sponsor must pay the undisputed portion of the invoice and submit a claim for the disputed amount. All claims with respect to withheld amounts must be submitted to Comcast by calling Comcast's National Accounts Billing Support at 866-511-6489. Comcast will make commercially reasonable efforts to address the disputed charges and fees within sixty (60) days.

4.4 Past-Due Amounts. Comcast reserves the right to charge interest at a rate of one and a half percent (1.5%) per month, or the highest rate allowed by law, whichever is less (prorated on a daily basis beginning on the past-due date) for the unpaid balance of any past due invoice that is not reasonably disputed in the manner set forth in this Agreement. Comcast's acceptance of partial payment shall not constitute a waiver of Comcast's right to collect the full balance owing, and Comcast reserves the right to determine the manner in which partial payments are applied. Sponsor agrees to pay all reasonable costs of collection incurred by Comcast as a result of Sponsor's failure to pay undisputed amounts due under this Agreement.

5. Term. 5. Term. This Agreement shall become effective on the Effective Date. The term of this Agreement shall commence on the Effective Date and continue through (DATE REQUIRED) (the "Term" end date), unless earlier terminated in accordance with the terms set forth herein. [Sponsor] hereby agrees to pay the Service Fees (as defined in Section 4 hereof) for each End User who receives Service prior to the expiration of the Term for a period that begins on the Service Commencement Date and ends when the End User is no longer part of the [sponsor].

6. Default by Sponsor. If Sponsor is in breach of a payment obligation (including failure to pay a required deposit) and fails to make payment in full within ten (10) days after receipt of a second written notice, Comcast may, at its sole

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Agreement

discretion, terminate this Agreement, terminate or suspend Service to Comcast Subscriber(s), and/or require a deposit, advance payment, or other satisfactory assurances as a condition of continuing to provide Service; except that Comcast will not take any such action as a result of Sponsor's nonpayment of a charge subject to a timely dispute, unless Comcast has reviewed the dispute and determined in good faith that the charge is correct. This Agreement may be immediately terminated by either Party, upon written notice, if the other party has become insolvent or involved in liquidation or termination of its business, or adjudicated bankrupt, or been involved in an assignment for the benefit of its creditors.

7. Termination.

7.1 Termination of a Service to Comcast Subscriber (s) for Cause. If a Comcast Subscriber (s) breaches Comcast's Agreement for Residential Services, which can be accessed at https://www.xfinity.com/corporate/customers/policies/subscriberagreement or its Acceptable Use Policy, which can be accessed at https://www.xfinity.com/corporate/customers/policies/highspeedinternetaup, as determined by Comcast, at its sole discretion, Comcast may, at its sole discretion, either suspend or terminate Service to the applicable Service Location(s) and shall provide Sponsor with notice of such termination.

7.2 Regulatory and Legal Changes. Notwithstanding any contrary provision of this Agreement, if Comcast's authority to provide Service to a Service Location(s) is terminated, cancelled, or expires, Comcast may terminate this Agreement or the affected Comcast Subscriber's Service.

8. Limitation of Liability.

8.1 EXCEPT AS OTHERWISE PROVIDED IN THIS AGREEMENT, COMCAST DISCLAIMS ALL WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE, AND NON-INFRINGEMENT TO THE MAXIMUM EXTENT ALLOWED BY LAW. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, COMCAST DOES NOT WARRANT THAT THE SERVICES WILL BE UNINTERRUPTED, ERROR-FREE, OR FREE OF LATENCY OR DELAY, OR THAT THE SERVICES WILL MEET SPONSOR'S REQUIREMENTS, OR THAT THE SERVICES WILL PREVENT UNAUTHORIZED ACCESS BY THIRD PARTIES.

8.2 EXCEPT IN THE CASE OF A BREACH OF CONFIDENTIALITY AS SET FORTH IN SECTION 9.1, OR BREACH OF THE PROVISIONS OF SECTIONS 9.3, 9.4, 9.5, 9.6 AND 9.9, NEITHER PARTY SHALL BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL, EXEMPLARY, OR PUNITIVE DAMAGES (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOST PROFITS OR LOST REVENUES) ARISING OUT OF THIS AGREEMENT, IRRESPECTIVE OF WHETHER OR NOT SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

9. Confidential Information.

9.1 Disclosure Use and Exceptions. "Confidential Information" means any non-public information regarding a party's business which has been marked or is otherwise communicated as being "proprietary" or "confidential," or which should be reasonably known by the receiving party as proprietary or confidential information. Without limiting the generality of the foregoing, Confidential Information shall include this Agreement, proposals, price quotes, rate information, discount information and invoices and Comcast Personal Information, as defined below. All Confidential Information and Comcast Personal Information as defined herein disclosed by either party shall be kept by the receiving party in strict confidence and shall not be disclosed to any third party without the disclosing party's express written consent. Notwithstanding the foregoing, such information may be disclosed (i) to the receiving party's employees, affiliates, agents and volunteers who agree to keep the Confidential Information confidential and who have a need to know for the purpose of performing this Agreement, installing the Comcast Equipment, using the Services, and rendering the Services (provided that the receiving party shall take appropriate measures prior to disclosure to its employees, affiliates, and agents to assure against unauthorized use or disclosure) or (ii) as otherwise authorized by this Agreement. Each party agrees to treat all Confidential Information of the other in the same manner as it treats its own proprietary information, but in no case will the degree of care be less than reasonable care. Notwithstanding the foregoing, and except for Comcast Personal Information, each party's

confidentiality obligations hereunder shall not apply to information that: (i) is already known to the receiving party without a preexisting restriction as to disclosure; (ii) becomes publicly available without fault of the receiving party; (iii) is rightfully obtained by the receiving party from a third party without restriction as to disclosure, or is approved for release by written authorization of the disclosing party; (iv) is developed independently by the receiving party without use of the disclosing party's Confidential Information; or (v) is required to be disclosed by law or regulation, provided that in the event the receiving party is required to disclose the Confidential Information of the disclosing party, the receiving party shall notify the disclosing party in advance unless prohibited from doing so by law.

9.2 Remedies. Notwithstanding anything to the contrary in this Agreement, the non-breaching party shall be entitled to seek equitable relief to protect its interests pursuant to this section, including, but not limited to, preliminary and permanent injunctive relief. Nothing stated herein shall be construed to limit any other remedies available to the parties with respect to breaches of the duties imposed by this section.

9.3 Survival of Confidentiality Obligations. Except for Sponsor's obligations with respect to Comcast Personal Information as set forth in Section 9.9 below, which survive termination of this Agreement indefinitely, the obligations set forth in this section shall survive the expiration or termination of this Agreement for a period of two (2) years.

9.4 End User Privacy. To enable Sponsor's payment obligations hereunder, and so that Sponsor is able to verify Sponsor End Users eligible for Sponsorship, the Parties may disclose the Personally Identifiable Information of Sponsor End Users to each other, with the Sponsor End User's consent. Neither party may sell, retain, use, or disclose such Personally Identifiable Information for any purpose other than for the specific purposes set forth in this Agreement. For the purposes of this Agreement "Sell" means selling, renting, releasing, disclosing, disseminating, making available, transferring, or otherwise communicating orally, in writing, or by electronic or other means, Personally Identifiable Information by one entity to another for monetary or other valuable consideration.

9.5 Sponsor Information. Comcast shall comply with all federal, state, and local laws that are expressly applicable to the privacy, and security of Sponsor Information, including but not limited to the requirements of the Family Educational Rights and Privacy Act (FERPA), 20 U.S.C. § 1232g, and its implementing regulations (34 C.F.R. part 99), the Children's Online Privacy Protection Act (COPPA), 15 U.S.C. § 6501-6505, and its implementing regulations (16 C.F.R. § 312, et seq.), the Protection of Pupil Rights Amendment, (PPRA) 20 U.S.C, § 1232(h) and its implementing regulations (34 C.F.R. § 98.1 et seq.), Pub. L. 104-191, and its implementing regulations (45 CFR part 160 and 164), and the Individuals with Disabilities Education Act, and its implementing regulations (34 C.F.R. §§ 300.610 - 300.626 and 34 C.F.R. §§ 303.400 – 303.417). Neither Comcast nor any of its employees, agents or affiliates, or subcontractors shall: (i) engage in targeted marketed advertising using Sponsor Information; (ii) use Sponsor Information to amass a profile about a Sponsor End User, except in connection with Comcast's performance of its obligations under this Agreement; (iii) or publish any report, data, or research findings that are based on Sponsor Information or that otherwise expressly identifies the Sponsor, without prior review and approval from the Sponsor, unless otherwise required by law.

9.6 Comcast Subscriber Information. The parties acknowledge and agree that in order to access and use the Services, an adult 18 years or older must agree to the Terms. The Service will be provided to Comcast Subscribers in their residence and will enable all members of the household to access the Internet during the term of their subscription. Accordingly, any information, including Personally Identifiable Information, provided by Sponsor End User directly to Comcast in the course of applying for or using the Services shall be treated as Comcast Subscriber Information. Comcast shall treat all Comcast Subscriber Information in accordance with its terms of use, privacy policy, and all laws applicable to Comcast. For purposes of clarity, the parties acknowledge and agree that Comcast Subscriber Information is not an Educational Record, as that term is defined under FERPA, and is not subject to the restrictions in Section 9.5.

9.7 De-identified Information. Comcast may collect and use aggregated de-identified Sponsor Information to provide the deliverables, products, and/or services set forth in this Agreement, for the Sponsor's lawful quality assurance, and for no other purpose; provided, however, that all direct and indirect personal identifiers are permanently removed and there is no reasonable basis to believe that the remaining information in the records can

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Agreement

be used to successfully link the de-identified information to an identifiable individual or the school or district.

9.8 Waiver of Liability. The parties acknowledge and agree that Comcast's obligations under this Agreement are limited to the "Services. Websites, webpages, and mobile apps accessed by Comcast Subscribers may collect Personally Identifiable Information. Comcast has no control over and shall have no liability for the collection use or disclosure of Personally Identifiable Information by any website, web page or other content not owned or controlled by Comcast.

9.9 Security. Sponsor shall employ commercially reasonable physical, administrative, and technical security controls appropriately tailored to the nature and scope of its activities and the sensitivity of the underlying data which shall in no instance be less protective than those used by Sponsor to secure its own confidential and proprietary information of a like kind and in all instances will conform to industry standards and any applicable legal requirements and regulatory guidance. Sponsor must maintain a plan for appropriate security incident management and response that complies with the terms of this Agreement to cover, at a minimum, the following: (i) unauthorized access, acquisition, disposition use of Comcast Subscriber Information, (ii) other loss or misuse of such information or (iii) discovery malware posing a significant threat to such information or any operations necessary to perform under this Agreement (each, a "Security Incident"). Sponsor must provide notification via electronic mail to SecurityFusionCenter@comcast.com of a Security Incident as soon as practicable after, but not later than, twenty-four (24) hours, following awareness of a Security Incident. For any Security Incident, Sponsor must provide regular updates to SecurityFusionCenter@comcast.com or, if directed by Comcast, to a security point of contact specifically designated by Comcast for the Security Incident and shall cooperate with Comcast or its regulators in its efforts to investigate the same. Comcast shall exclusively control the provision and content of any notices to Comcast Subscribers or applicable entities with respect to any Security Incident involving Comcast Subscriber Information.

9.10 Retention, Return or Destruction of Personal Information. Sponsor shall not retain Comcast Subscriber Information for a period longer than 90 days from receipt unless required to do otherwise by applicable law or legal obligation. Upon expiration or termination of this Agreement, or at Comcast's request, Sponsor will return all Comcast Subscriber Information to Comcast or, at Comcast's request, securely destroy all Comcast Subscriber Information and provide within ten (10) days of Comcast's request, a written attestation signed by an officer of the Sponsor, attesting that all Comcast Subscriber Information in all formats, including without limitation, paper, electronic and disk form, have been returned or securely destroyed, provided however, that foregoing obligation shall not extend to backup or archival copies of Personal Information that Sponsor generates in the ordinary course of business. Sponsor shall not process or use backed-up or archived Comcast Subscriber Information for any purpose other than to store it, and Sponsor will continue to apply security controls consistent with this Agreement to such Comcast Subscriber Information for the duration of its storage.

9.11 Sponsor Relationships. Sponsor must require all of its subcontractors with access to Confidential Information to comply in writing with security obligations substantially similar to this Agreement and shall provide written attestation or other evidence that affirms such compliance to Comcast promptly upon request. Sponsor shall conduct periodic reviews of such subcontractors' security controls to confirm that such controls are in compliance with this Agreement. In the event Sponsor identifies deficiencies in any such subcontractor's security controls, Sponsor shall maintain a report of such findings and ensure that such deficiencies are remediated within reasonable timeframes, commensurate with their severity.

10. Miscellaneous Terms.

10.1 Force Majeure. Neither party nor its affiliates, subsidiaries, or contractors shall be liable to the other party for any delay, failure in performance, loss, or damage to the extent caused by force majeure conditions such as acts of God, fire, explosion, power blackout, or other causes beyond the party's reasonable control, except that Sponsor's obligation to pay for Services during a force majeure condition shall not be excused.

10.2 Assignment or Transfer. Neither party may assign this Agreement in whole or in part, or delegate any of its duties or obligations thereunder, without the prior written consent of the other party, except that without such consent

(i) either party may assign this Agreement to a successor (by purchase, merger, operation of law, or otherwise) to all or substantially all of its business; and (ii) either party may assign this Agreement to an Affiliate, provided such entity agrees in writing to be bound by the terms hereof. Any purported assignment in contravention of this section shall be null and void. Subject to the foregoing, this Agreement will bind and inure to the benefit of any permitted successors or assigns. Nothing herein is intended to limit Comcast's use of third-party consultants and contractors to perform the Services.

10.3 Publicity. This Agreement provides no right for Sponsor to use Comcast's or its affiliates' trademarks, service marks, or trade names, or to otherwise refer to Comcast in any marketing, promotional, or advertising materials or activities. Sponsor shall not issue any publication or press release relating to, or otherwise disclose the existence of, the terms and conditions of any contractual relationship between Comcast and Sponsor, except as permitted by this Agreement or otherwise consented to in writing by Comcast. Sponsor agrees that Comcast can use Sponsor's trademarks, service marks or trade names in Comcast's marketing, promotional, or advertising materials or activities, unless Sponsor notifies Comcast that Sponsor objects to such use in writing. If Comcast is notified of Sponsor's objection to a specific use of its trademarks, then Comcast agrees to cease the use within five (5) business days.

10.4 Notices. All notices, demands, requests or other communications given under this Agreement shall be in writing and be given by personal delivery, United States Postal Service, or nationally recognized overnight courier service to the address set forth below or as may subsequently in writing be requested. If notices are sent to the Sponsor, (Sponsorship Name REQUIRED) they shall be sent to (Mailing Address REQUIRED) _____ Attn: (Contact Name REQUIRED) If notices are sent to Comcast, they shall be sent to One Comcast Center, Philadelphia, PA 19103 Attn: General Counsel.

10.5 Entire Understanding. This Agreement constitutes the entire understanding of the parties related to the subject matter hereof. This Agreement supersedes all prior agreements, proposals, representations, statements, or understandings, whether written or oral, concerning the Service or the parties' rights or obligations relating to the Service.

10.6 Construction. In the event that any portion of this Agreement is held to be invalid or unenforceable, the parties shall replace the invalid or unenforceable portion with another provision that, as nearly as possible, reflects the original intention of the parties, and the remainder of this Agreement shall remain in full force and effect.

10.7 Survival. The rights and obligations of either party that by their nature would continue beyond the expiration or termination of this Agreement shall survive termination or expiration of this Agreement.

10.8 Governing Law and Venue. This Agreement shall be interpreted and enforced in accordance with the laws of the State of (REQUIRED) without regard to its conflict of laws principles.

10.9 No Third Party Beneficiaries. This Agreement does not expressly or implicitly provide any third party (including Sponsor End User(s)/Comcast Subscriber(s)) with any remedy, claim, liability, reimbursement, cause of action, or other right or privilege.

10.10 No Waiver; Etc. No failure by either party to enforce any rights hereunder shall constitute a waiver of such right(s). This Agreement may be executed in counterpart copies.

10.11 Compliance with Laws. Each of the Parties agrees to comply with all applicable local, state and federal laws and regulations and ordinances in the performance of its respective obligations under this Agreement and related activities performed in connection with this Agreement, including without limitation, the CAN SPAM Act, Telephone Consumer Protection Act, Telemarketing Sales Rule, and the implementing rules and orders of the Federal Communications Commission.

Agreement

IN WITNESS WHEREOF, the parties hereto by their duly authorized representatives have executed this Agreement as of the date first set forth above.

Comcast   **Sponsor**

_____   _____

Name: Name:
Title: Title:
Date: Date:

Appendix E: High-level dig-once cost analysis

Cost estimate for standalone conduit construction: In this analysis, the City deploys its own conduit without any collaborative efforts and would shoulder all of the construction costs. It is recommended that the directional boring construction methodology be used to avoid the expensive hard-surface restoration costs of street, sidewalk, and driveway crossings.

Standalone Construction Costs				
Description	**Unit**	**Estimated Quantity**	**Price**	**Extended Price**
UNDERGROUND CONDUIT & HANDHOLE INSTALLATION				
Installation of Ground Rod	EA	2	$35.00	$70.00
Installation of One City Multi-duct using Directional Boring	FT	1,600	$35.00	$56,000.00
Installation of Handhole – Tier 22, 17" x 30" x 36"	EA	2	$250.00	$500.00
Handhole – Tier 22, 24" x 36" x 36"	EA	–	$850.00	$–
CONDUIT MATERIALS				
2-inch, SDR 11, HDPE Roll Duct	FT	5,280	$1.20	$6,336.00
7-Way Duraline Multi-Duct	FT	0	$3.00	$–
HANDHOLES MATERIALS				
Handhole – Tier 22, 17" x 30" x 36"	EA	–	$312.00	$–
Handhole – Tier 22, 24" x 36" x 36"	EA	2	$366.00	$732.00
CONSTRUCTION HARDWARE				
Ground rod, 8 ft.	EA	2	$30.00	$60.00
#10 copper tracer/ground wire, green insulation	FT	1,600	$0.36	$576.00
Markers, Soil Disk or Dome Post	EA	2	$30.00	$60.00
TOTAL COST:				**$64,334**

Cost estimate for joint construction, separated trench: The City digs a separate trench for the placement of conduit within the work limits of the shared project. Here the incremental cost of adding conduit includes materials, trenching, and backfill, but does not include repaving or restoring surfaces, as that is assumed to be part of the original project.

Individual Trench - Joint Construction Costs				
Description	**Unit**	**Quantity Per Mile**	**Unit Price**	**Price Per Mile**
UNDERGROUND CONDUIT & HANDHOLE INSTALLATION				
Installation of Ground Rod	EA	2	$35.00	$70.00
Installation of One 2-inch Conduit in new trench	FT	1,600	$8.00	$12,800.00
Installation of Handhole – Tier 22, 17" x 30" x 36"	EA	–	$250.00	$–
Installation of Handhole – Tier 22, 24" x 36" x 36"	EA	2	$850.00	$1,700.00
CONDUIT MATERIALS				
2-inch, SDR 11, HDPE Roll Duct	FT	1,600	$1.20	$1,920.00
7-Way Duraline Multi-Duct	FT	0	$3.00	$–
HANDHOLES MATERIALS				
Handhole – Tier 22, 17" x 30" x 36"	EA	–	$312.00	$–
Handhole – Tier 22, 24" x 36" x 36"	EA	2	$366.00	$732.00
CONSTRUCTION HARDWARE				
Ground rod, 8 ft.	EA	2	$30.00	$60.00
#10 copper tracer/ground wire, green insulation	FT	1,600	$0.36	$576.00
Markers, Soil Disk or Dome Post	EA	2	$30.00	$60.00
TOTAL CONSTRUCTION COST:				**$17,918**

Appendix F: Complete tables of contents, tables, and figures

Contents

Figures

Tables

Appendix G: Members of ConnectWaukegan

Jesus Alquicera	City of Waukegan, Engineer
Josue Cuevas	CUSD 60
Anne Durot	Volunteer
Celeste Flores	Mano a Mano
Jon Gaskill	Waukegan Public Library
Dave Giordano	Volunteer
Gale Graves	United Way Lake County
Isabel Guadarrama	City of Waukegan
Carol Hincker	Funder Representative
Doug Kasamis	Volunteer
Roudell Kirkwood	City of Waukegan, Alderman
Noelle Kischer -Lepper	City of Waukegan
Thomas Maillard	City of Waukegan
Megan McKenna	Boys and Girls Club, Lake County
David Motley	City of Waukegan
Tuwanda Peters	CUSD 60
Peggy Talbot	Volunteer
Anna Yankelev	Lake County Health Department