PROMOTING DIGITAL EQUITY IN TEMPE

Data and Recommendations

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EXECUTIVE SUMMARY

Long-standing inequalities in internet access and use became more visible in communities during the pandemic, undermining efforts to preserve the economy, education, and health care in the face of unprecedented disruptions. Beyond the pandemic shutdowns, however, these inequalities threaten the ability of communities to thrive in an increasingly digital economy, to innovate in digital government, or to prepare students **for the future**.

Currently there is the potential to bring about real change, when historic levels of federal funding are available to ensure that broadband, or high-speed internet, is **available in all communities**, and that residents have needed support for **widespread adoption and use**. In this context, the City of Tempe commissioned Arizona State University's Center on Technology, Data and Society to conduct a data scan, listening sessions and interviews to inform planning for activities to promote the goal of **digital equity**.

The City of Tempe is discussing the option of municipal ownership of a privately-operated network that would provide additional broadband services in the community. Recommendations made support the potential of such a **network for widespread, inclusive use**.

Findings

City-wide, Tempe's 94.7% of residents with broadband subscriptions is slightly higher than the 90.3% national average. In part, this is due to its status as a university community with many highly connected residents, but this city-wide average obscures disparities that exist across demographic groups and in neighborhoods.

According to the latest data from the US Census (footnote for 1-year and 5-year):

- 5.3% of Tempe residents lack any kind of internet subscription, even mobile. In total, nearly 21% of Tempe residents are unconnected or less-connected with mobile only or satellite.
- 9.2% of Tempe residents have mobile-only internet access, which is limited for important activities for education, jobs, and telehealth. Mobile-only internet users are more likely to be low-income, to lose service because of limited data plans, and to do less online.
- 6.6% have satellite internet access, which is more common in rural communities than urban areas. There are mobile home parks and other places in the city that are not currently served by incumbent providers. Satellite internet is more expensive and less reliable than terrestrial broadband, and many residents of these areas have no internet connections at all.
- There is variation by race, ethnicity, age, education, and income: approximately 9% of Black residents, 11% of Latino and Indigenous residents, and 14% of people 65 and older lack any kind of internet at all, even mobile subscriptions. One-quarter of residents without a high school education lack internet access.
- Areas in the northeast and central west sides of the city have between 10 and 19% of residents without any internet of any type (see maps).
- Tempe has important assets as well, with outstanding age-friendly internet programs, personalized support in libraries, and collaboration with the university. There is an opportunity to build upon these assets for the future.

Recommendations

Year 1

- Improve bandwidth and outreach at the public library; provide other spaces for public access, for Zoom, telehealth, homework and public Wi-Fi.
- Conduct outreach for the federal Affordable Connectivity Program that subsidizes internet access.
- Use multicultural and multilingual digital ambassadors and digital navigators for outreach and support; the digital navigator model emphasizes one-on-one assistance.
- Address areas with no internet availability with wireless connections as a short-term solution.
- Collaborate with Maricopa County and State of Arizona initiatives.

Years 2 and 3

- Create a diverse resident council on digital equity, to promote participation, co-creation of new applications, and communication with residents.
- Expand Age-Friendly internet programs to other areas of the city; current efforts to engage a greater diversity of participants through multilingual, multicultural digital ambassadors are critically important.
- Consider Boston and Chattanooga's "Tech Goes Home" model in schools with low rates of home broadband adoption; the program involves families and students in training together as well as providing an affordable connection and device.
- Keep pace with evolving technologies (such as artificial intelligence) in programs providing training and support.
- Make the city's website an accessible and central hub of information, including for events and neighborhoods. Some newer internet users had difficulty finding information on the site, so attention to navigation and usability may be needed to support participation by less experienced internet users.

Years 4 and 5

- For sustainability, integrate digital inclusion activities (such as outreach, training, and support) into existing programs for workforce development, social services, and education; pursue grants outside of federal broadband funds.
- Consider serving Guadalupe as well as Tempe residents with municipal broadband; it is a clearly underserved area and students attend Tempe schools.
- Continue to keep pace with evolving technologies (such as artificial intelligence) in programs providing training and support.

We provide information resources for municipal broadband and digital inclusion plans going forward. While we were charged with examining issues related to internet adoption and use, a municipally owned network would provide opportunities to influence quality of service, equitable coverage across neighborhoods, innovative uses in public institutions and public spaces, costs for low-income families, and affordability in the community more generally.

Introduction

The pandemic laid bare persistent inequalities in internet access and use in the United States, and in its wake, there are historic opportunities to address these disparities through federal funding, state planning processes, and local partnerships. The closure of schools and businesses emphasized the impact of internet use for individuals and communities, and that internet use is necessary for full participation in society today.

Numerous studies have demonstrated the impacts of internet use for economic opportunity (DiMaggio and Bonikowski 2008; Mossberger, Tolbert and McNeal 2008; Shearer and Shah 2018; Horrigan 2018), for education (Simoes, Oliveira and Nunes 2022; Bauer et al. 2020; Hampton et al. 2021; Caldarulo et al. 2022), health (Yu and Meng 2022; Sheon and Carroll 2019; Benda 2020; FCC 2022), civic engagement and access to government services (Tolbert and Mossberger 2006; Mossberger, Tolbert and McNeal 2008; Boulianne 2009; Purdy 2017), among others. There is a consensus that the availability of broadband, or high-speed internet services, creates economic benefits for communities (Gillett et al. 2006; Kolko 2010; Jayakar and Park 2013; Atasoy 2013; Mack 2014; Whitacre, Gallardo and Strover 2014: Gallardo et al. 2020) and the support of emerging 'smart cities' which can serve as crucibles for inclusive, resilient and sustainable urbanization.[1] The growing significance of 'smart schools' like Arizona State University, is being built upon investment in broadband, digital applications and big data practices, while digitally networked apps and sensors serve as the communicative means through which leadership, instructors, students and parents are connected and governed (Cheong & Nyaupane, 2022). Recent research shows that beyond the deployment of broadband infrastructure, communities with a higher percentage of residents who subscribe to broadband – who adopt it and use it - have even greater growth in community prosperity over time (Mossberger, Tolbert and LaCombe 2021).

It is in the interest of communities to promote equity for high-speed access, adoption, and the capacity to use digital technologies, for the benefit of both individual residents and the community. Consequently, it is important that the city's vision for digital equity includes the voices and perceptions of community stakeholders, to understand resident concerns and ideas about digital connectivity and digital futures (Cheong & Mossberger, 2022).

The City of Tempe asked an interdisciplinary team from the Center on Technology, Data and Society at Arizona State University for assistance in assessing needs and resources for the city's digital equity planning and programs. In fall 2022 and spring 2023, faculty and doctoral students from the School of Public Affairs and the Hugh Downs School of Human Communication conducted a data scan, listening sessions with Tempe residents, interviews with key stakeholder organizations, and research on planning and practice in other cities. This report summarizes key

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[1] (https://www.un.org/sustainabledevelopment/cities/)

findings and recommendations for action, with an appendix including resources for future planning.

Digital Equity and Digital Inclusion

Digital equity is "a condition in which all individuals and communities have the information technology capacity needed for full participation in our society, democracy, and economy. Digital equity is necessary for civic and cultural participation, employment, lifelong learning, and access to essential services," (National Digital Inclusion Alliance n.d.).[2]

> Digital equity - a condition in which all individuals and communities have the information technology capacity needed for full participation in society.

The term "digital inclusion" is used to describe the activities needed to reach that goal. According to the NDIA, an umbrella coalition of nonprofits, state and local governments, community anchor institutions, and researchers, activities for digital inclusion promote access to:

- 1. Affordable, robust broadband internet service;

- 2. Internet-enabled devices that meet the needs of the user;

- 3. Access to digital literacy training;

- 4. Quality technical support; and

- 5. Applications and online content designed to enable and encourage self-sufficiency, participation, and collaboration.

The NDIA further emphasizes that "digital Inclusion requires intentional strategies and investments to reduce and eliminate historical, institutional and structural barriers to access and use technology."[3] This may require attention to affordability, outreach, lack of awareness and informal support, and educational, language and cultural barriers for access and use.

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[2] https://www.digitalinclusion.org/digital-inclusion-101/
[3] https://www.digitalinclusion.org/digital-inclusion-101/

Broadband Internet Use in Tempe

The most recent data available on internet use in the City of Tempe is from the American Community Survey conducted by the US Bureau of the Census. Table 1 below shows Tempe in comparison with US data for 2021.

Table 1. Internet Subscriptions (%) for the City of Tempe, 2021 ACS, 1-yr Estimates			
Label	Total Tempe	% Tempe	% US
Total households	77,306		
TYPE OF INTERNET SUBSCRIPTIONS			
With an Internet subscription:	73,235	94.7%	90.3%
Dial-up with no other type of Internet subscription	46	0.1%	0.2%
Broadband of any type	73,189	94.7%	90.1%
Cellular data plan	70,711	91.5%	83.9%
Cellular data plan with no other type of Internet subscription	7,142	9.2%	10.9%
Broadband such as cable, fiber optic or DSL	65,046	84.1%	75.5%
Satellite Internet service	5,080	6.6%	6.7%
Without an Internet subscription	4,071	5.3%	9.7%
HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2021 INFLATION-ADJUSTED DOLLARS)			
Less than $20,000:	9,328		
Without an Internet subscription	1,002	10.7%	26.1%

As the above table shows, 94.7% of Tempe households had some type of internet subscription in 2021, which is slightly above the US average of 90.3%. Beyond these summary statistics for the city, it is necessary to explore variation by type of internet use, by demographics and by neighborhood, which are better indicators of needs across places and populations within the city.

> 5.3 % of Tempe households do not have an internet subscription. In total, nearly 21% of Tempe residents are unconnected or "less-connected" with mobile only or satellite for internet access.

The census defines as broadband any type of internet service other than dial-up, including cell phone and satellite connectivity. Yet, as the pandemic showed, there are limitations to dependence on cell phones for internet access, as they are not always suitable for bandwidth-hungry video applications such as telehealth services or online learning, and the small screens and keyboards don't accommodate well the filling out of electronic documents such as job applications, doing homework, or educational applications. For this reason, mobile-only internet users do less online than those without a computer and broadband subscription, controlling for other factors including education (Mossberger et al. 2012; Mossberger et al. 2017; Napoli and Obar 2014). They are also more likely to be low-income, Black, Latino, and Indigenous (Perrin 2021; Howard and Morris 2019) and to experience limited internet access because of data plans that run out quickly or to lose service because of inability to pay (Anderson and Horrigan 2016). The 9.2% of Tempe residents who are mobile-only internet users are therefore among the "less-connected," without full capacity to use the internet.

Satellite

The ACS shows that 6.6% of Tempe households have satellite internet; while close to the US average, the national average includes rural areas that lack broadband infrastructure through fiber, cable, or DSL. Although part of a large metropolitan area, urban Tempe has areas not served by providers like Cox or CenturyLink. In interviews, we discovered that satellite is the only service available in the Chaparral Village mobile home community, which has over 300 households.

> The 6.6% of Tempe households with satellite internet reveals gaps in the availability of reliable internet access in some areas of the city.

There are likely other gaps as well. At a meeting in the Escalante neighborhood, one resident said that there was no cable connection to his home, and so he has not been able to participate in the federal Affordable Connectivity Program, which subsidizes internet subscriptions for low-income households.

Figure 1. Federal Communications Map of Broadband Availability in Tempe.

Source: https://broadbandmap.fcc.gov/home
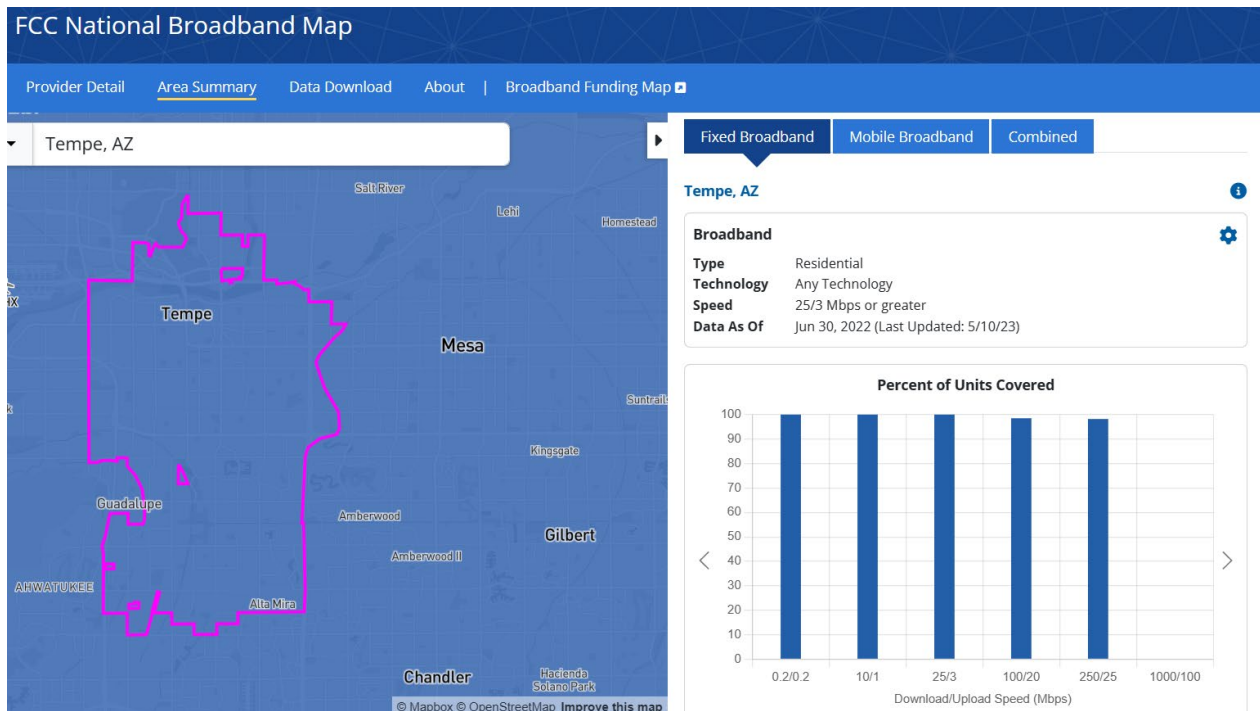
The Federal Communications Commission (FCC) data on broadband availability is shown in Figure 1, above. The FCC data, which is infamous for underreporting gaps in service (Howard and Morris 2019), shows that Tempe is fully served by incumbent providers at the FCC standard for broadband of 25/3 Mbps, and is nearly completely served at higher speeds.[4] But clearly there are "holes" in that provision, especially in lower-income areas in the city. While satellite is the best option where no infrastructure is available, it can be expensive, slow, and unreliable, especially in bad weather (Whitacre et al. 2018).

Affordability

Affordability is a major barrier for internet access, according to national surveys (Anderson and Horrigan 2016; Mossberger, Tolbert and Franko 2013; NTIA 2022), and clearly income is a factor in broadband adoption in Tempe. In 2021, 10.7% of households with incomes less than $20,000 a year had some type of broadband subscription. Interestingly, this is less than for the US overall, where over a quarter of the population at this income level has no subscription, even mobile. Communities with many college students tend to have higher rates of broadband adoption for low-income residents, given low student incomes and high need for internet access

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[4] Area Summary - Fixed | FCC National Broadband Map

(Mossberger, Tolbert and LaCombe 2021). But Tempe has a diverse community, where other low-income residents have few resources for internet use.

Demographics

To track variation within the city, the 5-year estimates from the American Community Survey show patterns by demographics and by census tracts. The estimates based on 5 years of data accommodate smaller samples for subgroups of the population and smaller geographies, but they are slightly lower than the one-year estimates. For example, the 5-year estimate for any type of internet use (2017-2021) in Tempe is 92.4% of households, as shown in Table 2 (below), and is a few percentage points below the 2021 1-year estimate in Table 1. The demographic estimates are also for the population (that is, for individuals) rather than for households.

Table 2. No Computer or Internet Subscription, the City of Tempe, 2017-2021 ACS, 5-year Population Estimates[5]				
Label	With computer, no internet subscription	Without a computer	Total with no internet subscription	Estimate in %
Total population in households	9,021	3,046	12067	7.19
AGE				
Under 18 years	1,276	431	1707	6.71
18 to 64 years	6,522	1,390	7912	6.37
65 years and over	**1,223**	**1,225**	**2448**	**13.46**
RACE AND HISPANIC OR LATINO ORIGIN				
White alone	4,254	1,994	6248	5.87
Black or African American alone	**893**	**233**	**1126**	**8.90**
American Indian and Alaska Native alone	**407**	**56**	**463**	**11.12**
Asian alone	716	27	743	5.02
Native Hawaiian and Other Pacific Islander alone	44	0	44	6.07
Some other race alone	**2,206**	**477**	**2683**	**21.32**
Two or more races	501	259	760	4.64
Hispanic or Latino origin (of any race)	**3,291**	**973**	**4264**	**10.93**
White alone, not Hispanic or Latino	3,564	1,691	5255	5.83
EDUCATIONAL ATTAINMENT				
Household population 25 years and over	5,789	2,433	8222	7.37
Less than high school graduate or equivalency	**1,432**	**289**	**1721**	**23.86**

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[5] Broadband, any type, includes mobile subscriptions, so mobile-only internet users are included in these percentages.

High school graduate (includes equivalency), some college or associate's degree	3,030	1,730	4760	9.32
Bachelor's degree or higher	1,327	414	1741	3.27
EMPLOYMENT STATUS				
Civilian population 16 years and over	7,806	2,645	10451	7.20
In labor force	5,127	1,044	6171	5.86
Employed	4,711	925	5636	5.70
Unemployed	**416**	**119**	**535**	**8.47**
Not in labor force	**2,679**	**1,601**	**4280**	**10.73**

As Table 2 shows, intersectional factors like race and ethnicity, socio-economic status, age and educational attainment play a significant role in broadband access. Bolded results highlight the most prominent disparities in Tempe's population. The greatest differences are based on education, as 24% of residents without a HS education lack an internet subscription. This suggests a skills gap as well as affordability barriers. Nearly 14% of residents 65 or older do not have an internet subscription, and the same is true for 11% of Latinos and Indigenous residents. Similarly, 9% of Black Tempe residents have no internet subscription, compared to 5 and 6% for Asian-American and white residents, respectively. Approximately 8% of the unemployed and 11% of those who are out of the labor force lack an internet subscription.

Neighborhoods

Disparities in internet access and use are spatially patterned within cities, reflecting the geography of poverty, race, and ethnicity. Moreover, the places where people live have an independent effect on internet access and use – for example, high-poverty neighborhoods decrease the likelihood of internet access, even controlling for an individual's income (Mossberger, Tolbert and Anderson 2017). The neighborhood environment may affect internet use because there are fewer opportunities for learning and support in personal networks in these places, or for use and support in institutions such as libraries and schools. Programs and organizations can also be targeted to build a more vibrant ecosystem for internet use in such areas (Rhinesmith and Kennedy 2020).

Neighborhood environments matter for internet use, providing support and opportunities for learning.

Some research has shown that incumbent internet providers may underinvest in poor neighborhoods (Callahan 2017; Whitacre 2019). This digital redlining or digital discrimination

can take different forms, with areas that lack broadband services, or that experience higher costs for lower speeds delivered through older technologies (Yin and Sankin 2022).

<div style="background-color: #F5B400; padding: 1em;">

Digital redlining can also occur in low-income neighborhoods, raising costs or diminishing services for those areas.

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The following maps produced by the City of Tempe, based on the 2017-2021 ACS, show how internet subscriptions vary across census tracts in Tempe; for the population of the tract overall (Figure 2), and for Black, Latino, and Indigenous populations by census tract in Figures 3, 4 and 5. Figure 6 shows results for residents with household incomes of less than $20,000 by census tract.

Notably, the Escalante Multi-Generational Center where we conducted meetings, which is marked in the northeast of Tempe in Figure 2, is part of an area with lower rates of internet subscription. Also marked in Figure 2 is the location of Chaparral Village mobile home community, which lacks service from cable or DSL providers. This mobile home community, which has only cell phone or satellite service, is in an area with particularly low rates of internet access (as 18.2% of residents in that census tract lack an internet subscription of any type).

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Some areas of the city have only cell phone or satellite service available, despite the FCC data that says all areas are served.

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While Tempe overall has rates of internet subscription that are slightly higher than national averages, there are census tracts where almost 19% of residents lack internet subscriptions. There is even greater racial and ethnic variation in subscription rates by neighborhood; there are census tracts in Tempe where 60% of Black residents lack internet subscriptions, as well as tracts where between one third to a half of Latino residents lack internet subscriptions, and where one third to three quarters of Indigenous residents have no subscription. In census tract 3184, 59.8% of Black residents are without an internet subscription, accounting for around 75 residents. The 75.4% of Indigenous residents in census tract 3188 who lack internet subscriptions totals around 200 people. Overall, there is a clear pattern where disparities are greater for people of color.

There are census tracts where nearly 19% lack internet subscriptions, and disparities are greater for people of color.

Patterns for low-income households, in Figure 6 (in orange) look a bit different than census tracts that have low rates of internet access overall, perhaps because of concentrations of students in some areas.

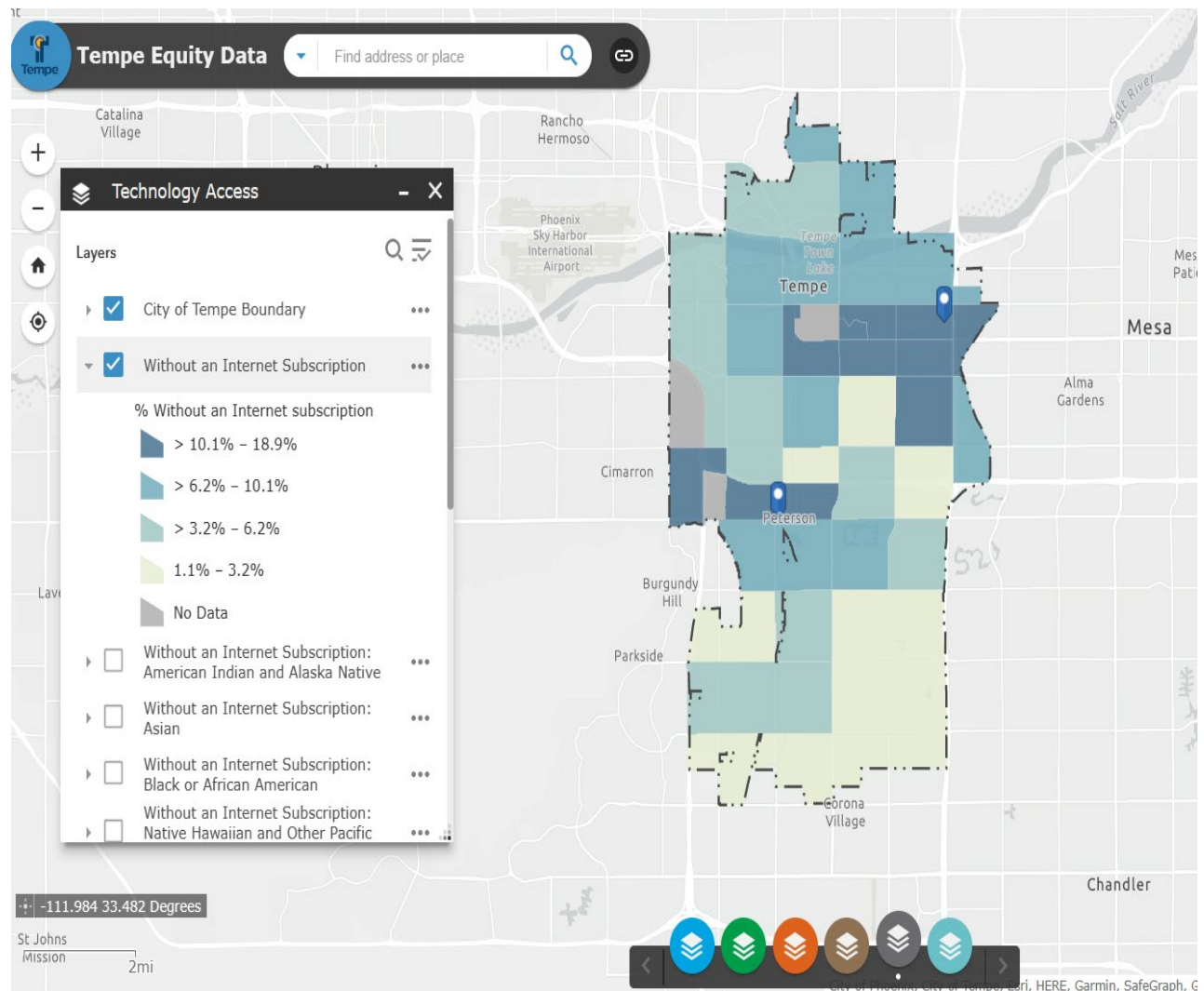**Figure 2. % of Tempe Population without an Internet Subscription by Census Tract, 2017-2021 ACS**

Figure 3. % of Black Population without an Internet Subscription, by Census Tract, 2017-2021 ACS
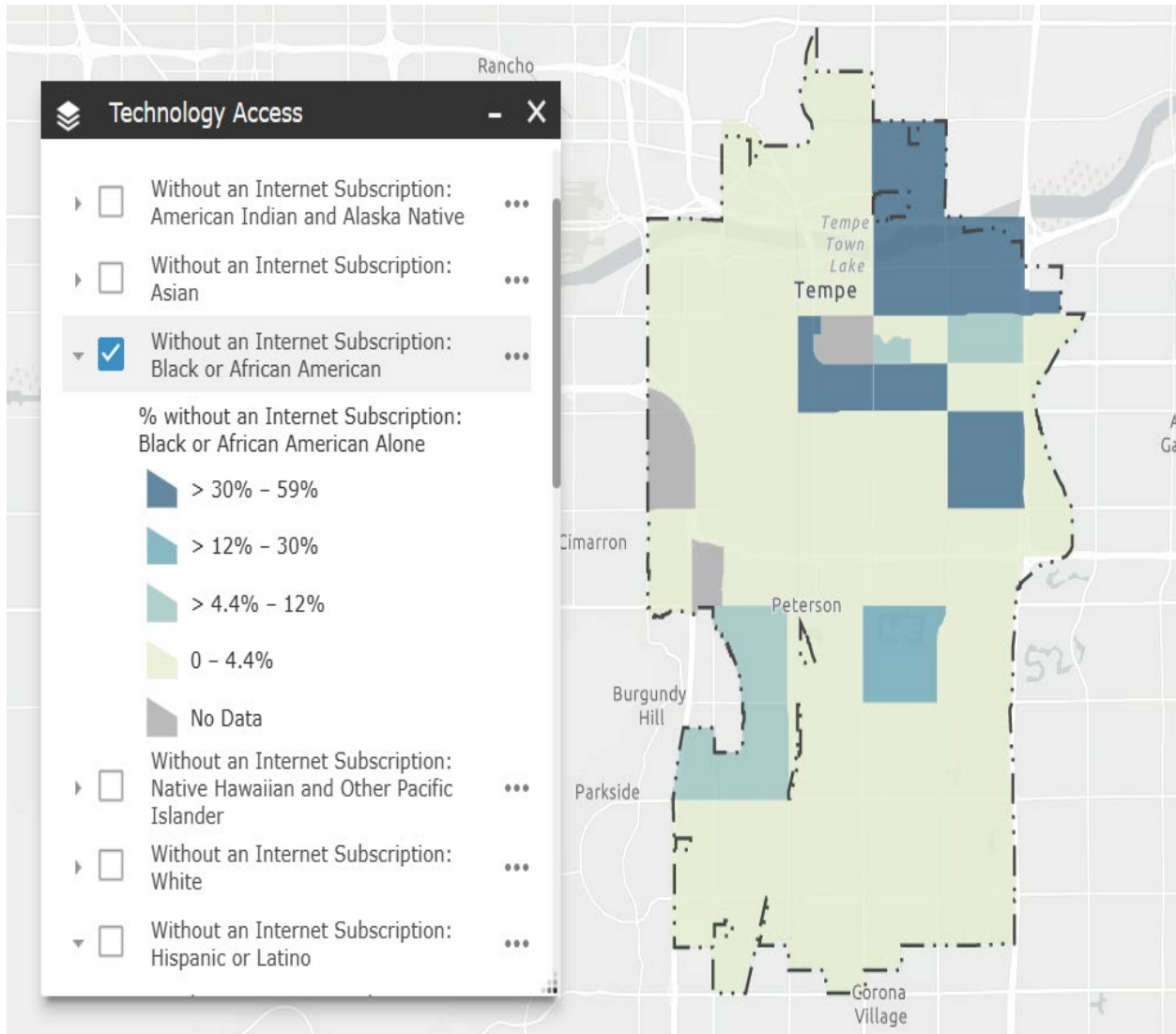
Figure 4. % of Latino Population without an Internet Subscription, by Census Tract, 2017-2021 ACS
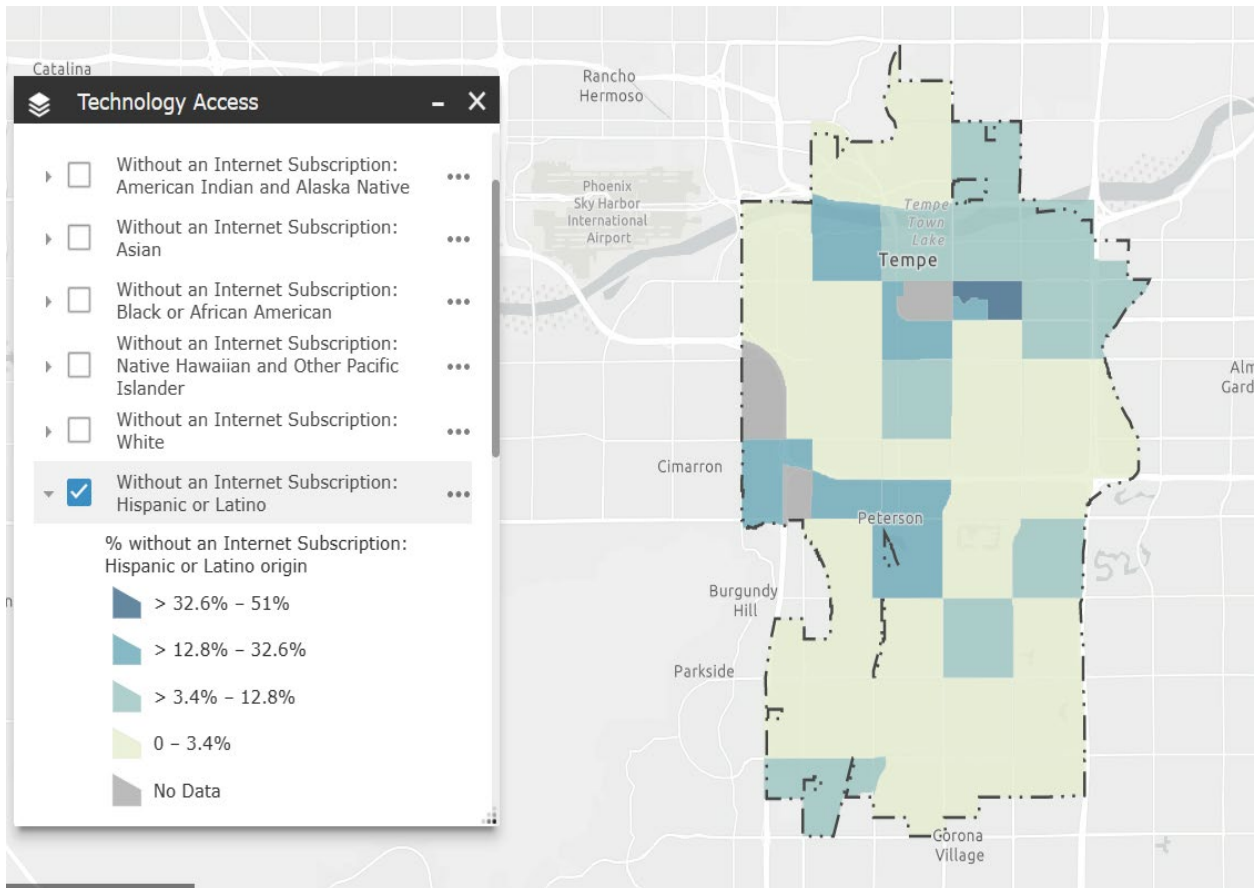
Figure 5. % of Indigenous (AI/AN) Population without an Internet Subscription, by Census Tract, 2017-2021 ACS
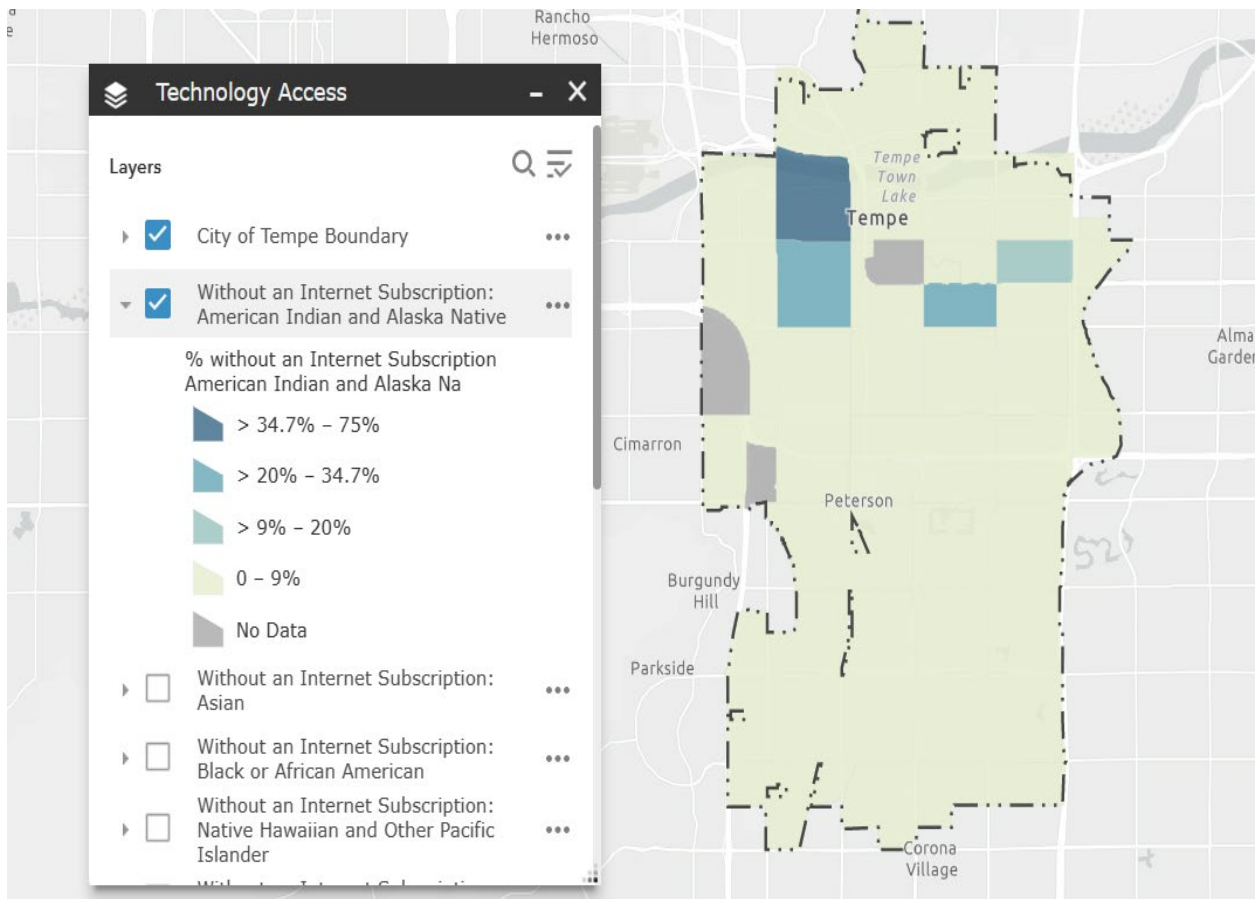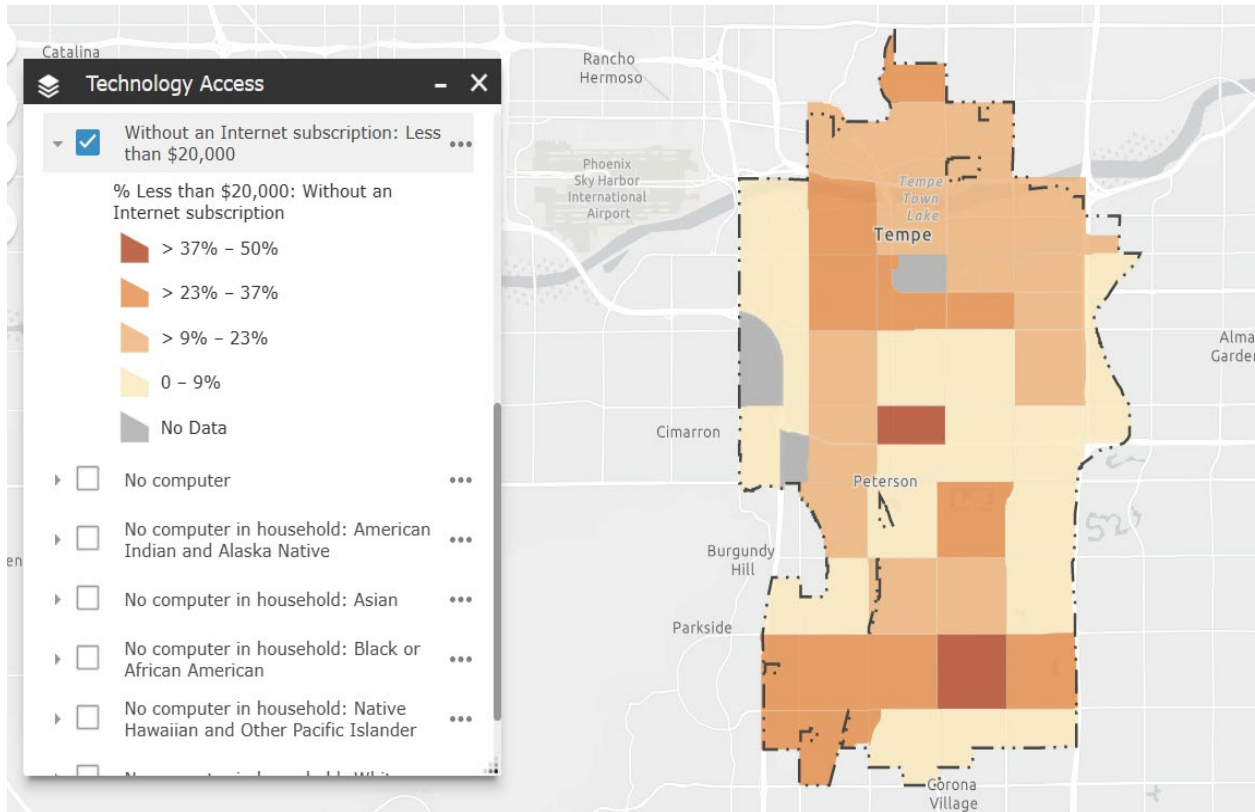
Figure 6. % of Population with Annual Income under $20,000 without an Internet Subscription, by Census Tract, 2017-2021 ACS

Barriers

Data from the census only cover connectivity and devices and don't reveal why people don't have broadband subscriptions or what problems they may be encountering with technology use. What are the barriers they experience for internet use, and even if they are broadband adopters, what policies or programs might be needed to improve their connectivity and their ability to participate online? In 2022, Tempe added two questions to its annual community survey[6] and results are shown below for the 934 respondents who answered. When asked whether they had internet access at home, 94.6% reported that they did, parallel to the 2021 1-year estimates for Tempe in the ACS.

When asked about barriers respondents feel are preventing them from using the internet to connect with education, government services, social media and information, Tempe respondents mentioned:

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[6] City of Tempe, AZ Dashboard Portal - ETC Institute

- Lack of choice for internet providers 22.1%
- Cost of service 16.6%
- I don't know how to find what I need 11.2%
- Other barriers 7.4%
- Training and education on how to use the internet 4.5%
- Lack of adequate devices 2.7%

Respondents included people with internet access, yet lack of choice and cost of service were common complaints, and the need for support or training is an issue for some residents as well.

> Lack of choice and cost of internet service are common barriers for accessing the internet, according to the city's 2022 community survey.

ASU researchers conducted two meetings with Tempe residents at the Escalante Multi-Generational Center. One meeting was held with seniors, many of whom had participated in the Connect Tempe programs for older adults, and another meeting was open to neighborhood residents of any age and was advertised in the area by postcards sent out by the city. As might be expected, many of those in the senior meeting, who were relatively new internet users, discussed the need for continuous and up-to-date learning and socio-technical support. At the neighborhood meeting, there was more discussion about the quality of service, costs, and experiences with incumbent providers, as well as the need for the city to provide clear communications with residents.

Additionally, interviews were conducted with key organizational stakeholders about their experiences assisting residents with internet use in Tempe: the director of the senior training program, a library specialist at Tempe public library who provides internet training and support, a high school counselor, the current director of IT in Tempe, and a manager at a mobile home community.

As result of these meetings, interviews, and a review of federal programs and experiences in other cities, we present recommendations for responding to the needs and opportunities that were identified.

> Meetings with residents and interviews with local organizations point to steps that the City of Tempe can take over the next 5 years to create a community that is highly connected, equitable, and inclusive.

RECOMMENDATIONS

The City of Tempe is considering a municipally owned network that is operated under contract with a private sector provider. While the decision to undertake such a project is based on many factors (and is beyond the scope of this report) a municipally owned network could facilitate digital equity in the city in many ways, promoting universal availability, affordability, and supporting outreach and training efforts. We make recommendations for these aspects of digital inclusion, for the next year, the next 2-3 years and the next 4-5 years.

Year 1: Expand Digital Access as a Foundation for Equity

Access to the internet includes both connections and devices. Public access can provide important support, although personal access to an internet connection and home computer facilitates more practice and a wider range of activities online, including more complex activities for job search, health information, and education (Mossberger, Tolbert and Franko 2013; Mossberger, Tolbert and Anderson 2017). While the FCC data show all areas of Tempe have broadband service available, clearly there are some holes in internet coverage. Additionally, municipal ownership would provide the city with leverage to ensure faster and more reliable connections, including for municipal buildings as well as businesses and residences.

Public Access

- **Promote library programs by improving bandwidth.** While the library is a key point of public access for residents without home internet or who need training or technical support, the library has inadequate bandwidth for classes, with crashes occurring anytime 10 or more people are using it at once. Library internet connection is reportedly slow on startup (taking up to 10 minutes, which takes away instructional time for technology and training classes). This is frustrating for the inexperienced users who are in the training classes.

- **Provide free and inclusive places to connect to online spaces and resources**, taking into account the rise of video-based platforms (for example, rooms and support for residents to participate in zoom or hybrid meetings, including telehealth, prescription, and translation services, as well as for work interviews, education, training and counseling purposes) in community centers, libraries etc.

Affordability

- **Increase competition with incumbent providers with affordable alternatives**. Costs are a barrier for low-income seniors and families, the major barrier for many of those who are not online or are mobile-only users. As a result, seniors experience isolation without the internet. Students are unable to attend classes, do their homework and their families have less ability to track student progress or connect with teachers. Expense (initial costs & ongoing upgrades) was an issue raised repeatedly at the neighborhood meeting and in organizational interviews, and a lack of competition and choice also affects households who may not qualify for subsidies.

- **Build affordability for low-income households into any plans for a municipal network.** Ft. Collins, CO offers gigabit service to residents whether they have the $19.95 a month discounted rate or whether they pay full price. Other cities, like Chattanooga, offer 300 Mbps for $27.95 a month or gigabit service for $37.95 a month for qualified households.[7] The Affordability Connectivity Plan subsidy (ACP) can be applied to either Chattanooga plan, although households with children receiving free or reduced-price school lunches were already eligible for free 300 Mbps service prior to the ACP program.

- **Collaborate with the Digital Equity Institute and Maricopa County to address upselling by Cox and other incumbent providers in region, and for resources and strategies on outreach for the FCC's Affordable Connectivity Program (ACP).** There is evidence that Cox is "upselling" households that are eligible for the federal subsidy. This subsidy offers up to $30/month to internet providers to cover connectivity for low-income households. Providers nationwide have pledged to offer true broadband plans that would not require further payment, though subscribers have the option of applying this toward a more expensive plan and paying the balance. Participants in Tempe's senior program and at the neighborhood meeting have encountered upselling and have reluctantly signed up for more expensive programs.

- **Broaden outreach to get qualified residents online via the Affordable Connectivity Program (ACP).** The City of Tempe has a low rate of take-up for the ACP according to an analysis by the Benton Institute based on FCC enrollments by zip code shown in Appendix 1 (Horrigan 2023). We recommend that the city should:
    - Promote ACP & clarify costs to residents
    - Leverage existing community center programs and events
    - Connect with national networks for resources for outreach, like the National Digital Inclusion Alliance, and Aspen Institute's Latinos & Society program, which is developing bilingual outreach materials.

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[7] https://epb.com/billing-services/affordable-connectivity-program/#get-started

- **Provide a bridge to free, refurbished or discounted computers, laptops and tablets, for residents seeking to replace broken or outdated phones.** The affordability of devices can be a barrier, too. Resources can be provided through libraries, senior programs, ACP and other programs. The library needs tablets for its participants, as they are useful to help seniors and mobile-only users more generally to transition to devices other than phones.

Availability and Quality of Service

- **In planning for municipal broadband, consider opportunities for the community overall, but address access for high need areas first.** This includes underrepresented, vulnerable and marginalized populations like mobile home families, students and seniors. Interviews with management of the Chaparral Village mobile home community indicated that K-12 students used the management office for schoolwork during COVID, and to this day, they congregate there to do homework after school. Some residents do have satellite internet, but this is more expensive than other types of internet access and is known to be slower and less reliable than terrestrial broadband. There are likely other areas or individual addresses without connections to the home. More generally, residents at the neighborhood meeting complained of slow and unreliable connections at times. They asked why the municipal Wi-Fi had not rolled out as promised.

- **Advance wireless solutions such as mesh networks for areas without access as an immediate solution.** Access is needed now in some areas, including for mobile home park residents. The city can collaborate with Digital Equity Institute and ASU to provide wireless access in the short term even if municipal fiber will be built out later.

- **Consider advice from other cities in decision making and planning for municipal fiber networks.** While many municipally owned networks have been in rural areas, that is not always the case. Ft. Collins, CO is a university town that believes that a municipal network with gigabit speeds is needed to support innovation for the future as well as equitable access. Colorado's enabling legislation has allowed other communities in their region to develop networks, too. Chattanooga, TN is a pioneer in municipal networks, with recent upgrades to 25 gigabit service, and a leader in digital equity. Municipal networks may be operated by cities or in partnerships with private contractors. Both cities operate their own networks, but the former city manager of Ft. Collins has pointed out that this required building the back-office capacity for maintenance, billing and more. See Appendix 2 for links on these cities.

- **Participate in national networks to benefit from prior experience.** According to Chris Mitchell of Community Networks/Institute for Local Self-Reliance, broadband planning includes asking cities about what went wrong and how they responded. Having a local champion is important to see through a project that will take several years. This is a role that consultants can't fill. See Appendix 2 for links to Community Networks and another

organization, Next Century Cities, to find out more about other cities with community networks and their experiences.

- **Collaborate with the state broadband office to investigate funding opportunities.** Funding from the federal Infrastructure Investment and Jobs Act (IIJA) is channeled through the state, so the city would need to apply for federal funds through the Arizona Commerce Authority, which is responsible for state broadband planning.
- **Explore funding for Tempe through Maricopa County.** Other funding may be available through Maricopa County, which has dedicated $34 million of its ARPA funding for broadband and digital inclusion programs.

Years 2-3: Innovate Technology Use to Achieve Life Goals

The goal of digital equity is to enable individuals to fully participate online and engage in a variety of uses that can benefit them and society. As more residents gain or improve their internet access, there will be a need to develop new skills or to get support to stay online. This may be especially true for older residents who lack experience with the internet and for households with schoolchildren, where students are developing their capabilities for the future. Digital inclusion programs can promote learning in the context of uses that matter to residents, with individualized help through "digital navigators." Once residents are connected, there is a need to build a digital ecosystem of institutions and programs citywide to encourage meaningful use and continued learning. Tempe already has some important assets for this but may need to expand or enhance programs going forward.

Planning Programs

- **Establish a multicultural and multilingual resident technology council to obtain regular community feedback**. Support to solicit diverse voices in co-constructing the meaning and practices of digital equity is critical and can also be improved by holding focus group discussions in places where residents gather, or in schools, where it is convenient and accessible for residents and where food and childcare can be provided.

Seniors

- **Expand and build on Connect Tempe**, a model program that uses the Senior Planet curriculum from AARP as well as resources developed through grants for people with dementia. The program excels at offering a personal touch for learning, support, and repair. The Connect Tempe program is in the process of expanding its technology course

offerings and one-on-one support. It is currently available at Escalante but should be considered in other neighborhoods as well.

- **More outreach to residents from diverse cultural and ethnic backgrounds is needed for senior programs**, and there are new digital ambassadors being added for this purpose. This is critical to address the needs in Tempe, as participants in the existing program are less diverse than the city or the Escalante neighborhood where it is offered.

Supporting Students and Families

- **School-community programs for digital inclusion can involve and empower parents as well as students**, affecting outcomes for household jobs, health and other needs as well as educational needs of students. Research shows that students who have broadband at home have better educational outcomes, not only for test scores, but for homework, college applications, and more (Bauer et al. 2020; Hampton et al. 2021, Caldarulo et al. 2022). Tempe should consider adopting a model program (below) that has shown results elsewhere, and that could complement extended access through the ACP and/or municipal broadband.

  - Tech Goes Home was initially launched with Boston public schools and funding from the city of Boston, to provide free broadband, a device, and training and support for parents as well as students on Saturdays. This has now been replicated by Chattanooga to leverage the impact of its affordable municipal broadband for local students and their families. This is an outstanding school-centered program that has larger neighborhood impacts, supporting school-home connections and reaching into the community beyond the school. Program evaluations have provided evidence of positive effects for this program.

Tech Goes Home | Digital Equity | Training, Access, Technology

Tech Goes Home - The Enterprise Center (theenterprisectr.org)

Support and Outreach Citywide

- **Consider whether or how to scale up elements of the model senior programs with content that might be useful for other age groups in free workshops.** Training should address key topics like app installation, account creation, changes to default settings, upgrades for software & digital applications, use of the Internet to find cost-savings, start a business or generate sales, or data management and safeguarding privacy.

- **Provide weekly or regularly accessible, drop-in office hours/technical support for troubleshooting and repair of gadgets** - in open, inclusive community spaces like

libraries, schools, community centers and religious organizations. Computer repairs and one-on-one troubleshooting and tech support have been provided in senior programs and in the library through collaboration with ASU students, but these could be expanded.

- **Discuss ways to use digital ambassadors for outreach and digital navigators for one-on-one assistance more generally.** The library is using this navigator model as well as classes, but expansion of digital navigators may be considered there or in other locations in Tempe. The National Digital Inclusion Alliance has useful materials, including training for digital navigators.

- **Login procedures at libraries can be a hurdle for inexperienced users and there is a need to simplify them while maintaining cybersecurity.**

- **Outreach should be a priority for digital inclusion programs wherever they are located.** Since the pandemic there has been a decrease in attendance for library classes and one-on-one help, and this seems in part to be due to a lack of awareness about what is available. Library outreach is primarily through social media, which may not be as effective as newsletters and flyers for people who are offline. Organizations such as Chaparral Village have asked about library programs and offered to advertise them in newsletters and other publicity that reaches residents. Other community organizations could help to market programs. Participants at the neighborhood meeting mentioned that postcards sent out by the city are an effective tool. Translation and multilingual outreach are needed in schools and neighborhoods.

Promoting Use of Government Services and Information Online

- **One way to encourage internet use is to focus on the usability and promotion of services, information, and participation in the city's own programs.** This could include an audit for ease of use and accessibility for the city's website. We heard requests in the senior meeting for easier downloads and navigation.

- **At both the senior meeting and general neighborhood meetings, residents asked for more events and news on the city website.** There is an opportunity to think about new ways to make this a hub for information and civic participation as well as service delivery.

Years 4-5: Build Sustainable Infrastructure, Community Engagement and Ownership

Digital inclusion efforts will be needed to address outreach, affordability, skills and support over time. If a municipal broadband network is launched, the city will want to support its use by residents and to explore opportunities for innovation. Additionally, as federal funding sunsets for infrastructure investments, outreach and training, and possibly for the ACP, Tempe will need to consider how to sustain digital equity in the community.

Broadband Collaboration and Sustainability

- **The city should explore the possibility of serving residents of Guadalupe as well as Tempe through a municipal broadband network.** Guadalupe is a small town of only 1 square mile with limited staff and high needs for digital equity. In 2021, 5-year data showed that Guadalupe had only 57.3% of the population with any kind of broadband subscription, even mobile. Thus, over 40% were unconnected. Students from Guadalupe attend Tempe schools, and digital inequalities in Guadalupe affect Tempe classrooms, too.

- **Outreach should continue through collaboration with schools and community organizations.**

- **Continue to offer training and support that responds to the evolution of technology and the innovation that municipal broadband will facilitate.** Provide refresher and updated courses, to "keep up" with evolving digital needs and services, e.g. the benefits and challenges of generative AI tools like ChatGPT.

- **For sustainability, digital inclusion activities should be integrated into existing programs, such as workforce development, education, neighborhood services, and more.** This encourages meaningful uses and learning in context, as well as financial sustainability. These should not be regarded as "add on" programs but a natural part of how government services operate today.

- **Expand capabilities through grant funding, which may be available for innovative programs.**

Civic Engagement

- **Communicate with the community on the impact of residents' input.** Residents would like to hear and witness how their joint participation in digital equity-related programs

or meetings have led and will lead to positive outcomes for their community. This was an issue raised at the neighborhood meeting.

- **Co-create new applications with residents**, e.g. a transportation app, or applications for small business programs.

- **Establish good data governance practices for the city's digitalized services and applications**, in terms of data rights and privacy (in line with Digital Bill of Rights).

To implement these recommendations, we offer some further resources in the appendices.

The Table in Appendix 1 shows an analysis of ACP enrollment in Tempe.

Resources for developing policy in Appendix 2 include links for federal programs administered through the National Telecommunications and Information Administration (the BEAD and Digital Equity Act programs), links on municipal broadband in Fort Collins, CO and Chattanooga, TN, and national organizations with information on broadband policy, digital inclusion, community broadband and local government initiatives.

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APPENDIX 1. AFFORDABLE CONNECTIVITY PROGRAM ENROLLMENT IN TEMPE

Zip Code	Performance Category	Total Households	Eligible Households	The Affordable Connectivity Program Enrollment Performance Tool (January 2023)	
				Predicted ACP Enrollment	**Actual ACP Enrollment**
85283	Lowest	19006	7823	3261	2086
85284	Lowest	7070	1003	491	184
85281	Lowest	26312	17961	6521	2882
85282	Lowest	23101	10387	3960	2267
85287	N/A				

See explanation of data and how performance was measured in the interactive map below, as well as updates over time at:

ACP Tool | Benton Institute for Broadband & Society

APPENDIX 2. FEDERAL FUNDING AND ORGANIZATIONAL RESOURCES

National Telecommunications and Information Administration

- Home | Internet for All

- Programs | Internet for All

    - IIJA (administered through state, Arizona Commerce Authority)

    - BEAD AND DIGITAL EQUITY ACT

Examples of Municipal Broadband (non-rural)

Ft. Collins, CO – Municipal Broadband, discounted gigabit service for qualified households

- Fort Collins Connexion | Community-Owned Broadband Service (fcconnexion.com)

- Digital Inclusion Program- Fort Collins Connexion (fcconnexion.com) $20 a month, no installation fees

Chattanooga, TN – largest city with municipal broadband, long experience

- [How Chattanooga, Tenn. is leveraging digital inclusion to open its innovation district to all (brookings.edu)](#)

National Organizations

National Digital Inclusion Alliance

Broad coalition with over 1,000 members including cities, counties, states

Trailblazer list (best practices), resources for planning, digital navigators, listserv with rich participation and resources (consider joining listserv and becoming a member)

[Home - National Digital Inclusion Alliance](#)

Benton Institute for Broadband & Society

Headline news for broadband and digital inclusion, research

[Benton Institute for Broadband & Society | Broadband Delivers Opportunities and Strengthens Communities](#)

Community Networks – Institute for Local Self Reliance

Advice and networks for municipal broadband

[| Welcome to Community Networks (communitynets.org)](#)

Next Century Cities

Network of local governments to promote digital inclusion and broadband use, see case studies

[Home - Next Century Cities](#)