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Digital Equity is an Environmental Justice Issue

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MPH 683: Integrated Learning Experience

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Digital Equity is an Environmental Justice Issue

Digital equity has evolved into a more critical area of focus due to the novel coronavirus (COVID-19) pandemic. The COVID-19 pandemic exacerbated the existing digital divide, or the divide that exists between those who have access to the internet and those that do not, by moving many important services and resources online to reduce the spread of the virus. This shift has created more challenges for communities who either lack or have inadequate access to the internet. Furthermore, it is likely that internet utilization will only increase as we continue to recognize its capabilities. A lack of or inadequate access to the internet has implications for access to social justice issues, including environmental justice. This paper explores current literature, policy, and discourse related to digital equity in the United States, making the case that it is an environmental justice issue and advocating for comprehensive access to household broadband internet. To achieve digital equity in the context of promoting environmental justice, it is important to critically review policy related to digital equity, advocate for policies that improve digital equity, establish digital equity as a social determinant of health, and ensure communities are able to access the internet, afford the internet, and have the digital literacy skills necessary to navigate it safely and effectively. Establishing digital equity as an environmental justice issue allows the potential of the internet to be realized as a platform in which information exchange and communication can occur to advance environmental justice.

Introduction

The digital divide, which is defined as disparities in access to the internet (Schweitzer, 2015), has existed since the inception of the internet with unequal access existing across population sub-groups. The digital divide is of particular relevance currently due to the novel coronavirus (COVID-19) pandemic, which has resulted in the transition of essential resources

and services to online platforms to a greater degree than ever before (Early & Hernandez, 2021). Furthermore, digital inequity has implications for access to social justice.

The primary purpose of this paper is to focus specifically on environmental justice (EJ) and demonstrate that digital equity is an EJ issue. The secondary purpose of this paper is to identify meaningful ways to address the digital divide with the goal of promoting EJ. Although this issue transcends international borders, this paper will focus on the United States (US) with a particular emphasis on Black and lower income communities who are disproportionately and cumulatively impacted by digital inequities and environmental injustices (Breville, 2017; Cushing et al., 2015; Mikati et al., 2018; Pew Research Center, 2021; Varshavsky et al., 2016).

This paper will establish recommendations based upon current literature, policy, and publicly available discourse around how to achieve digital equity in the context of promoting EJ through establishing digital equity as an EJ issue, advocating for the passage of the Affordable, Accessible Internet for All Act (H.R. 1783), engaging key stakeholders around this issue, and establishing digital equity as a social determinant of health. Realizing digital equity will, ultimately, allow for the internet to be used as a meaningful tool to address environmental injustices and improve environmental health.

Background & Literature Review

Digital equity is defined as "... a condition in which all individuals and communities have the information technology capacity needed for full participation in our society, democracy, and economy" (National Digital Inclusion Alliance, n.d.). Although the importance of digital equity has been established, data from February 2021 indicated only 77% of individuals in the US have household broadband internet access (Pew Research Center, 2021), resulting in about 28,000,000 US households who remain disconnected (United States Census Bureau, 2019).

However, this data does not provide insight into internet speeds nor individual levels of digital literacy, both of which can be barriers to accessing the internet (Benda et al., 2020; Early & Bustillos, 2018; Early & Hernandez, 2021). The Federal Communications Commission (FCC), the national agency responsible for regulating communications, similarly collects data that does not capture comprehensive levels of access – a major critique of the information used by the FCC to make regulatory decisions (Early & Hernandez, 2021). Given this critique, the FCC has recently taken steps to capture more robust data that reflects true broadband internet access, with one recent example in 2021 of the agency modifying reporting requirements (Federal Communications Commission, 2021a).

Additionally, although progress has been made around increasing public Wi-Fi availability and internet access via mobile devices, these methods are insufficient in achieving digital equity. For example, there are valid security concerns when using public Wi-Fi and financial barriers around using mobile devices for internet access (Collins et al., 2014; Sieck et al., 2021). Due to these numerous issues, it is imperative that every individual have access to affordable household broadband internet.

Beyond access to services and information, the internet also holds potential to encourage civic engagement to address social justice issues. The internet has been highlighted as a tool by which to facilitate work around “social movement networking and public opinion influence” (Slatin, 2020). Civic participation like this ultimately enhances the capacity to move from research to action and impact policy (English et al., 2018).

There are also examples of using the internet as an effective method for civic engagement. In Tallahassee, Florida, a biomass site was permitted to begin construction and operations based on regional air quality standards, However, when the community reviewed the

proposal, they recognized establishing this site would have overwhelmingly negative environmental impacts, prompting community constituents to successfully advocate against the construction of this plant using GPS, cameras, and Google Earth (Jordan et al., 2011). At an international level, the internet has become a key tool in China to promote the work of Environmental Non-Governmental Organizations (ENGOS), allowing for more collaborative efforts not limited by geographic location (Liu, 2011).

Furthermore, a priority area in efforts to achieve social justice is addressing EJ, which is defined by the US Environmental Protection Agency (US EPA) as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies” (United States Environmental Protection Agency, 2021). This indicates that lack of or inadequate internet access is out of alignment with the US EPA’s EJ goal of meaningful involvement of all people if it is a barrier to effective participation in platforms through which information exchange and communications occur.

Several governmental agencies, including the US EPA, have made efforts to increase transparency and engage communities around exposures to toxic environmental hazards through free and publicly available resources on the internet including the US EPA’s Toxic Release Inventory (TRI) (United States Environmental Protection Agency, 2019), the Centers for Disease Control and Prevention (CDC) Environmental Health Tracking (CDC, 2020), and the US EPA’s EJ Screening and Mapping Tool (United States Environmental Protection Agency, 2020). Although these resources are theoretically accessible by a mobile device capable of connecting to the internet, it is 1) challenging to run queries and review data presented on a mobile device,

limiting one's ability to adequately collect information using these resources and 2) presumptuous to assume that one has the financial means to use cellular data in this way.

There are also sociodemographic characteristics rooted in structural racism that increase one's risk of experiencing environmental injustices and digital inequities in the US. Access to and utilization of the internet is disproportionately lower in low income communities as well as for individuals who identify as Black, Indigenous, and/or Hispanic/Latinx (Anderson & Kumar, 2019; Howard & Morris, 2019; Jain et al., 2021; Ong, 2020). This is confirmed by the Pew Research Center, where data shows 80% of White individuals, 71% of Black individuals, and 65% of Hispanic individuals have access to household broadband internet; and 92% individuals with an annual household income of \$75,000 compared to 57% individuals with an annual household income of less than \$30,000 have access to household broadband internet (Pew Research Center, 2021). Communities of color and low-income communities are also disproportionately impacted by environmental injustices in the US (Breville, 2017; Cushing et al., 2015; Mikati et al., 2018; Varshavsky et al., 2016). There is, therefore, a cumulative impact of digital inequities and environmental injustices for these populations.

The digital divide we experience as a country exists due to financial barriers, lack of clear incentives on the part of internet service providers (ISPs) in terms of laying down necessary infrastructure for internet connections particularly in rural locations, and lack of digital literacy (Collins et al., 2014; Early & Bustillos, 2018). For purposes of this paper, the focus of the digital divide will be on access in four areas: 1) existence of the necessary infrastructure (e.g., fiber, cables) to connect a household to the internet; 2) ability of a household to pay for broadband internet and related devices (e.g., laptops, computers, tablets); 3) adequacy of internet speeds to access information and services; 4) ability of the household to understand the information

presented on the internet (e.g., Is the information presented at the correct literacy level? Is the information provided in a language that the population being prioritized understands? Can the population being prioritized navigate the internet?).

The digital divide has become a relevant topic of conversation over the past year (2020-2021) with the novel COVID-19 pandemic. During this time, access to critical resources moved online to greater degree than ever before (Early & Hernandez, 2021), leading many to position broadband internet as a social determinant of health (Benda et al., 2020; Fridsma, 2017), and even a “super determinant of health” that allows for access to healthcare services and community conversations (Bauerly et al., 2019; Sieck et al., 2021). Furthermore, the internet has been established as a source of health information, with many indicating they prefer conducting research on the internet about health information over connecting with a health professional or, alternatively, will utilize the internet to connect with a health professional (Ali-Hassan et al., 2020; Haluza et al., 2017; Scanlan, 2021).

Considering the implications of bolstering EJ efforts using the internet in terms of reducing mortality, the World Health Organization (WHO) estimated in 2016 that 12.6 million deaths worldwide were linked to dangerous environmental exposures (Neira & Prüss-Ustün, 2016). Recognizing the harms caused by exposures to toxic environmental contaminants and the disparities in these exposures, addressing EJ has been established as a priority both for the Biden Administration and, accordingly, the US EPA (Biden, 2021; EPA Press Office, 2021).

Prioritizing EJ work is also a cost effective effort, with a 2015 report indicating that a reduction in exposures to environmental hazards could save just the state of California \$250 million annually (California Environmental Health Tracking Program, 2015). Furthermore, beyond its abilities to connect people to necessary information and services, leveraging the

internet to engage communities can drive down administrative costs of outreach and provide a platform to hold free, publicly available resources about environmental health (Collins et al., 2014; English et al., 2018). These capabilities are beneficial to researchers and organizations working in the EJ field. Additionally, increasing access to the internet has positive economic implications – it can increase opportunities for business, provide upward job mobility, expand healthcare opportunities, and drive down healthcare costs (Haderlie & Weiss, 2015).

Efforts have been made in the US to address digital inequity. The Emergency Broadband Program established by the FCC has helped many individuals connect to the internet during the COVID-19 pandemic by reducing financial barriers (Federal Communications Commission, 2021b). There have also been efforts at a community level - one such example is the Yakima Valley Broadband Action Team (BAT), an organization in Yakima, Washington, that recognized the potential for household broadband internet access to facilitate access to education, healthcare, and social justice. The Yakima Valley BAT promoted an internet speed test and developed a needs assessment to better understand community assets and resource gaps as they related to broadband internet (Fuller, 2021; Yakima Valley Community Foundation & Yakima County, 2020).

At a national level, the E-Rate Program through the FCC reduces the cost of internet for eligible schools and libraries (Federal Communications Commission, 2020). In 2010, the Open Internet Order promoted free speech and limited the ability of ISPs to discriminate based upon ability to pay, however it was repealed in 2017, a decision that has been scrutinized for its potential to worsen existing inequities (Early & Bustillos, 2018). In 2021, the Biden Administration released the American Jobs Plan, which would allocate \$2 trillion for infrastructure development, some of which would go towards broadband internet (The White

House, 2021a). Also in 2021, the bipartisan Accessible, Affordable Internet for All Act (H.R. 1783) was re-introduced to release federal funding for internet access in unserved or underserved communities (Early & Hernandez, 2021; H.R. 1783 - Accessible, Affordable Internet for All Act, 2021). See **Figure 1** for a Socioecological Model demonstrating the multiple levels of influence related to digital equity and EJ.

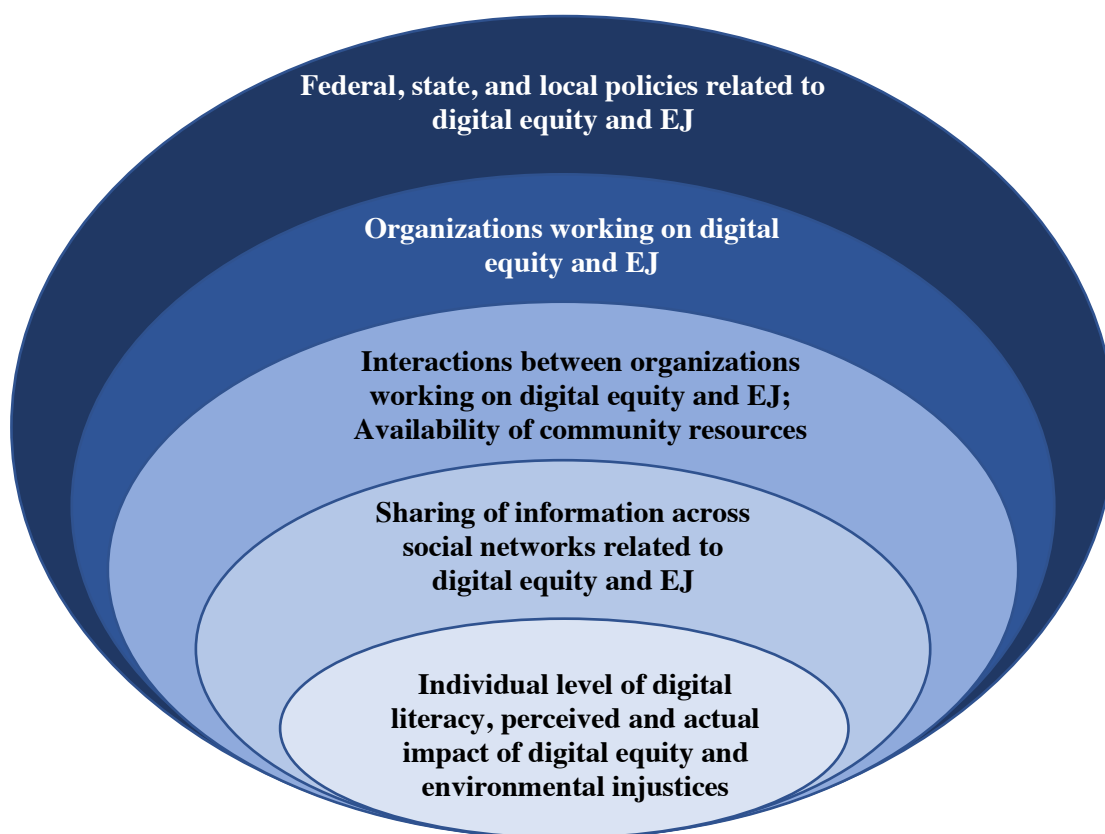


Figure 1. Socioecological Model: Digital Equity & Environmental Justice

In conclusion, there are opportunities for EJ work that are missed when those who are disproportionately impacted by environmental injustices also remain disconnected to the internet, however, opportunities exist to alleviate this issue. One method is through the passage of the Accessible, Affordable Internet for All Act (H.R. 1783). Furthermore, opportunities exist to establish digital equity as an EJ issue and as a social determinant of health to harness the power of the internet to address environmental injustices, and engage key stakeholders on this issue.

Overall, internet access allows for the establishment of communities impacted by environmental injustices as experts who can contribute to knowledge, aligning with the concept of alternative epidemiology (Wing, 1998). These communities should be able to easily access data related to environmental health where they live and work as well as to communicate environmental concerns in their community, which may not be captured by larger datasets.

Context for this Work

As part of the internship requirement of the Master of Public Health (MPH) Program at the University of San Francisco, or USF (please see **Appendix A** for a list of MPH competencies addressed in this paper), I worked with the Yakima Valley BAT to address digital inequities in Yakima Valley, Washington from June 2020 to April 2021 (Yakima Valley Community Foundation & Yakima County, 2020). We promoted an internet speed test to supplement data from the FCC and created, distributed, and analyzed the results of a needs assessment to better understand gaps and opportunities as they relate to broadband internet access and utilization in the community (Fuller, 2021).

Concurrently, I continued my employment with the University of California, San Francisco's Program on Reproductive Health and the Environment (UCSF PRHE). UCSF PRHE studies the effects of exposures to toxic environmental chemicals on reproductive health and child development, translating scientific findings into information that can be used to inform clinical care and policy (Program on Reproductive Health and the Environment, 2021). It was through this separate but complementary work that I recognized the potential to address digital equity as an EJ issue.

To understand the present digital divide, I worked closely with the BAT on their needs assessment development, reviewing previously established assessments around community

broadband access (City of Seattle, 2018; Stevens County/Spokane Tribe Broadband Action Team, 2019) with another MPH student at USF. I also met with the BAT on a regular basis to discuss and learn about the unique challenges faced by the community regarding broadband internet access. I listened into meetings where digital equity was discussed at a state level as well as Fiber for Breakfast calls conducted by the Fiber Broadband Association which provided a foundational understanding of historical and current policy related to broadband internet on a national level (Fiber Broadband Association, 2021). Recognizing the opportunity to establish digital equity as an EJ issue based upon my experience and current role in the environmental health sector, I began to look into the literature to supplement my understand of digital equity and EJ.

Methods

I searched PubMed, Scopus, and Google Scholar to identify primary sources. I also conducted Google searches to identify policy updates and publicly available discourse related to broadband internet in the US. I limited my search to 2011-2021 to ensure that the information I was reviewing was as relevant as possible and I only reviewed literature written in English, as this is the language I am most fluent in. The key words I utilized to identify primary sources included: “internet access” AND indigenous AND broadband AND “social determinant of health” AND “digital divide” AND “environmental” AND “health” AND racial/ethnic AND disparities AND “environmental health” AND “digital equity” AND technology AND “environmental justice” AND “internet access” AND internet AND justice AND environmental activism AND communities AND native. I also engaged with coworkers at UCSF PRHE who are experts in the field of environmental health and environmental health policy for recommendations on literature to supplement my review, which expanded my search criteria to

articles that touched on racial justice. Additionally, I decided to remove publications that focused primarily on smartphone utilization, mobile health, and inpatient portals as these topics are beyond the scope of this paper.

I reviewed all abstracts identified in my search to determine relevance to my thesis. If they were relevant, I proceeded to read the entire paper and extract key findings. I then reviewed current policies and publicly available discourse related to broadband internet to understand how to synthesize the literature and make recommendations.

Recommendations

Although the US has much work to do, there are feasible, actionable ways to start improving digital equity and leverage the power of the internet to address environmental injustices. Specifically, there is opportunity to advocate for the passage of H.R. 1783, establish digital equity as a social determinant of health, and identify digital equity as a method to generate meaningful civic engagement around EJ work by engaging key stakeholders.

Advocating for the passage of H.R. 1783 is an important first step in addressing the digital divide (Early & Hernandez, 2021; H.R. 1783 - Accessible, Affordable Internet for All Act, 2021). This bill was re-introduced in March 2021 and most recently (April 2021) was referred to the Subcommittee on Commodity Exchanges, Energy, and Credit. It would release almost \$100 billion in federal funding towards increasing broadband internet access and affordability in the US. Its overall goals are to better understand affordability as it relates to broadband internet access, understand how effectively federal funds have been allocated to increase broadband access to individuals who are considered to be at a “social disadvantage” when considering access, establish a digital equity grant program for states, increase broadband internet affordability especially for lower income households, establish greater pricing

transparency for broadband ISPs, expand access in unserved and underserved regions, and provide Wi-Fi on school buses. The bill also requests that states who wish to be awarded a digital equity grant collaborate directly with stakeholders, which include but are not limited to nonprofit organizations, individuals residing in rural regions, and veterans.

Furthermore, the bill also includes environmental mitigation activities as they relate to broadband infrastructure as an allowable cost for grant awardees. This is crucial, as developing the infrastructure for broadband does have inherent environmental hazards that cannot be ignored. For example, both the creation and disposal of technology devices may lead to exposure to hazardous materials (Williams, 2011), which is discussed in more detail later in this paper.

As the bill is reviewed by relevant subcommittees and other key stakeholders, it is important to critically evaluate it to ensure it is accomplishing what it has set out to achieve and understand its pros and cons compared to the status quo (**Table 1**). If ultimately passed, I recommend continuing to evaluate the bill specifically as it relates to equity (1) and efficiency (2):

- 1) Evaluating this bill as it relates to equity means looking at how it distributes costs and benefits across the population. As the goal of this policy is to connect everyone across the US to efficient broadband internet, benefits should be equitably distributed across population subgroups. These benefits could be evaluated by reviewing which states request and receive digital equity grant funding, annual progress reports from states who receive the funding, as well as reviewing updated FCC data to determine how many households are connected to broadband internet five years after this bill goes into effect.

- 2) Evaluating this bill as it relates to efficiency means reviewing it from a cost-effectiveness standpoint, looking at how the policy meets objectives while being mindful of financial impacts. The efficiency of this particular bill could be evaluated in terms of how effectively it increases access to job opportunities and reduces healthcare costs. One could review the impact on job opportunities by looking at employment rates across the US five years after the passage of this bill. The reduction of healthcare costs could be reviewed by looking at the number of telehealth visits for preventative care that occurred five years after the passage of this bill and estimating how these services reduced the need for more costly curative care.

Table 1. Evaluation of H.R. 1783 v. Status Quo		
	Positive Outcomes	Trade-Offs
Accessible, Affordable Internet for All Act (H.R. 1783)	<ul style="list-style-type: none"> ❖ Expanded access of broadband internet to all individuals living in the US ❖ Increased affordability of broadband internet 	<ul style="list-style-type: none"> ❖ Potential environmental hazards related to increasing access ❖ Lack of clarity around how funds may be re-allocated from other programs to support this bill
Status Quo	<ul style="list-style-type: none"> ❖ Ability to budget effectively for this as it is the current status quo 	<ul style="list-style-type: none"> ❖ The digital divide will increase, leaving many individuals living in the US behind in terms of opportunities for economic mobility, civic engagement, access to healthcare services, education, and social justice

Additionally, there are some suggestions I would make to improve this bill as it is currently written, and others like it, in the interest of promoting social and environmental justice. The first suggestion is to more widely communicating the bill to the general public and, in particular, the communities of interest that are considered to be unserved or underserved in terms of broadband internet access to gather their comments and feedback on the proposal. For

example, at this point in time the only method through which I was able to provide feedback on this bill was navigating to the proposed bill itself online, which is written in extremely technical language, locating my representative, and then searching for their contact information. It was not easy to determine how to provide feedback and, furthermore, the fact that it appears to be most easily accessed online poses a barrier for communities who currently experience access issues.

The second recommendation relates to the requirement as outlined in the bill for states interested in receiving the digital equity grant to establish a State Digital Equity Plan. I would go a step further to suggest that all states be required by H.R. 1783 to have State Digital Equity Plan regardless of whether or not they are applying for digital equity funding. Lastly, I would advocate that the lawmakers increase the benchmark that establishes “adoption of broadband service” currently proposed by the bill (H.R. 1783 - Accessible, Affordable Internet for All Act, 2021). As it is written, the bill utilizes the FCC’s minimum benchmark for broadband internet at connection speeds of at least 25 megabits per second (Mbps) download and 3 Mbps upload (Federal Communications Commission, 2015), however this benchmark has been widely debated and considered insufficient by many, with recent bipartisan efforts advocating for the FCC to review and increase it (*Bennet, King, Portman, Manchin Urge Biden Administration to Create Modern, Unified Federal Broadband Standard*, 2021).

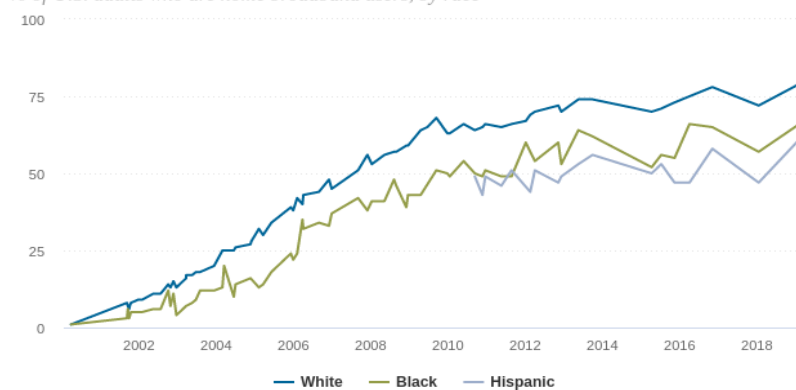
Another step towards addressing digital equity in an effort to improve EJ is establishing digital equity as a social determinant of health. In the Healthy People 2030 Objectives, while increasing access to broadband internet is included as an objective, it is categorized under health communications and information technology, not as a social determinant of health (Healthy People 2030, 2020). Reclassifying digital equity as a social determinant of health is important as

governmental organizations like the CDC utilize these objectives to determine program priorities. Therefore, establishing broadband internet access as a social determinant of health would provide the necessary traction for the CDC and other governmental organizations to prioritize programs and allocate additional federal funding that supports digital equity (Centers for Disease Control and Prevention, 2021). Furthermore, there is support in the literature around establishing broadband internet access as a social determinant of health that was discussed even before the COVID-19 pandemic forced much of life to online platforms (Bauerly et al., 2019; Benda et al., 2020; Early & Bustillos, 2018; Early & Hernandez, 2021; Sieck et al., 2021).

Lastly, I recommend that addressing digital equity be identified as a method to generate meaningful civic engagement for EJ work. In doing so, we can continue to move away from the technocratic model and towards a model that correctly legitimizes local knowledge (Coburn, 2005; Cordner et al., 2019). Connecting with communities facilitates understanding of the

Home broadband use by race

% of U.S. adults who are home broadband users, by race



Note: The Center has used several different question wordings to identify broadband users in recent years, which may account for some variance in broadband adoption figures between 2015 and 2018. Our survey conducted in July 2015 used a directly comparable question wording to the one conducted in January 2018.

Source: Surveys conducted 2000-2019. Data for Hispanics includes only surveys that included Spanish-language interviews.

Figure 2. Source:

<https://www.pewresearch.org/internet/fact-sheet/internet-broadband/?menuItem=3109350c-8dba-4b7f-ad52-a3e976ab8c8f>

environmental impact of policies, research, programs, businesses, and other ventures, and the internet is conduit through which conversation can and does occur to address challenges and opportunities (Jordan et al., 2011). Therefore, there needs to be a greater effort to conceptualize digital equity

as an issue of concern for individuals working in environmental health and EJ. To my knowledge, there is currently just one blog post (Funes, 2021) and one dissertation (Dailey, 2008) that explicitly explore digital equity as an EJ issue, pointing to major gaps in current literature, understanding, and recognition.

As a first step, key stakeholders (see **Appendix B** for examples) need to be involved in conversations about how digital equity has implications for EJ. Evaluation of this specific

recommendation can occur through surveying

organizations working in environmental health to understand the impact of digital inequities on their own work. Furthermore, one can review data from the Pew Research Center and maps from EJScreen (see **Figures 2 & 3** for examples) to assess (ideally on an annual basis) how progress related to EJ and digital equity is being made by race/ethnicity and income level.

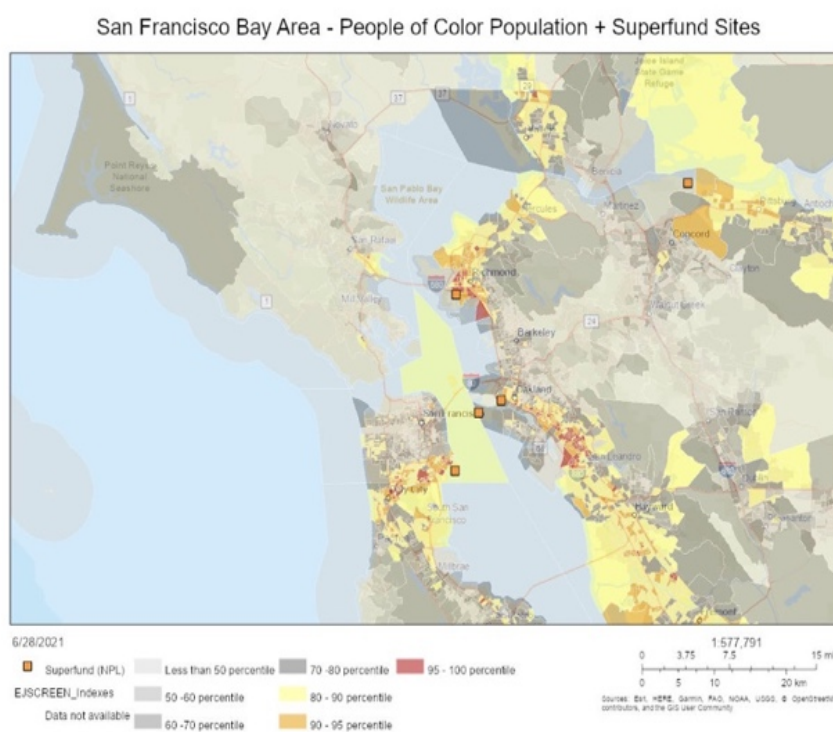


Figure 3. Source: <https://ejscreen.epa.gov/mapper/>

Implications & Discussion

Improving digital equity has broad implications for public health in the context of EJ. There is opportunity to address and even mitigate environmental health issues by ensuring

individuals have access to a variety of resources and can participate in communication platforms via the internet. However, there are also important limitations to consider when pursuing digital equity in the context of EJ work (**Figure 4**).

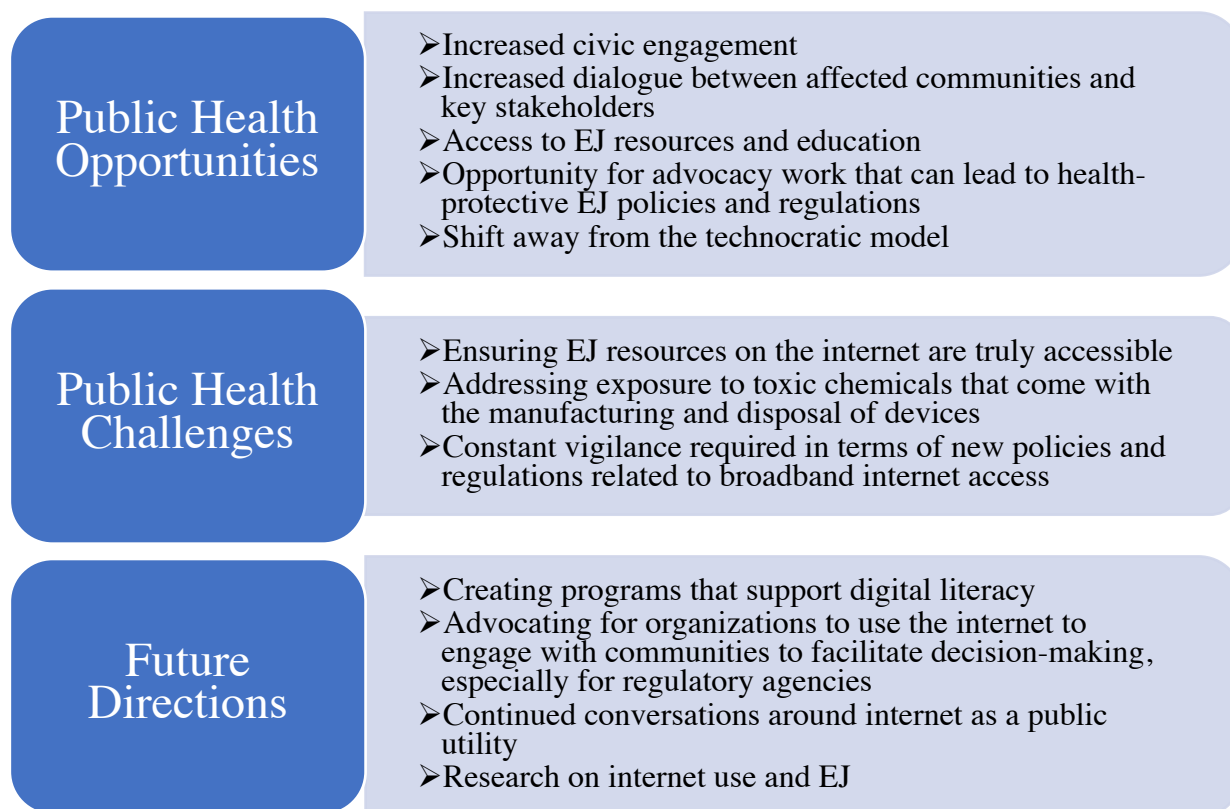


Figure 4. Summary of Implications

Access to the internet allows communities to obtain resources and participate in discourse related to environmental injustices. Increasing education about EJ can empower individuals, facilitating their understanding of how to reduce harmful environmental exposures on an individual and community level. The caveat, however, is that these resources are only beneficial if they are truly accessible to individuals via the internet, which can be accomplished by achieving digital equity and making EJ resources easy to locate, easy to navigate, written at appropriate literacy levels, and culturally relevant for communities.

Access to these resources on the internet can accelerate conversation across geographic barriers around environmental health issues between communities who may share similar experiences and can engage in discourse around challenges and opportunities. These conversations hold the potential to inform advocacy work and generate public pressure around environmental injustices. This type of advocacy work can impact policy and provide information for key stakeholders (e.g., policymakers, politicians, regulatory agencies, etc.) to make health protective decisions. Furthermore, these conversations and the knowledge acquisition and generation that comes from using the internet as a medium, supports the continued shift of power dynamics away from a technocratic model and towards one that correctly establishes affected communities as credible sources (Cordner et al., 2019). This paradigm shift is particularly important in the context of EJ, in which national or even state datasets and/or traditionally trained experts in the field may have an incomplete understanding of the nuances of environmental injustices for a specific community.

Furthermore, the increased civic engagement that comes with using the internet to address EJ can improve one's social capital, which has positive implications for overall health (Office of Disease Prevention and Health Promotion, 2021). For example, in one cross-sectional study, researchers found a positive association between civic engagement and physical activity as information about physical activity resources were communicated through a social network (Marquez et al., 2016). This same concept could, therefore, be applied to information sharing on the internet about environmental injustices and resources.

There are, however, also important limitations when considering digital equity as an EJ issue. Specifically, individuals working to manufacture and recycle technology devices may be exposed to toxic chemicals, namely brominated flame retardants (Williams, 2011), which can

cause several negative health outcomes including cancer and developmental disorders. One must be aware of these exposures and actively seek to mitigate them while concurrently striving to improve digital equity. Additionally, as policies and regulations regarding broadband internet are still relatively novel, it is important to continue to be critical of proposals to determine who is truly benefitting most from them – the general public, ISPs, or other large corporations – and how they will impact environmental injustices. For example, even as this paper was finalized, the Biden Administration signed an executive order that included directives related to the previously repealed Open Internet Order, specifically net neutrality, and demonstrated support for an infrastructure bill that would allocate \$65 billion to broadband infrastructure (New York Times, 2021; The White House, 2021b).

To alleviate these issues, one must focus on lessening the harmful health effects and bolstering the benefits and co-benefits of improving digital equity as it relates to EJ. For example, a particular co-benefit is the reduction of vehicle traffic, and, therefore, the associated pollution, due to telecommuting or accessing services via the internet from ones' home rather than in person (Williams, 2011).

Future work that continues to balance the positive and negative effects of achieving digital equity in the context of addressing EJ should inform programs that support digital literacy so that all individuals are able to navigate the internet successfully and safely and can access available EJ resources. There is also opportunity to require organizations, like the US EPA, to more proactively engage with communities using the internet to facilitate their work in a meaningful way, establishing a mutually beneficial relationship in which communities are empowered to inform regulatory decisions more directly.

Neither digital equity nor EJ will be achieved through just one policy or regulation - these are critical areas that require prioritization in the public health field. Ultimately, this work can inform research on how the internet is being used to address environmental injustices, novel methods to further leverage its abilities in terms of addressing EJ, and the association between digital equity and environmental health. Furthermore, conversations about policies establishing the internet as a public utility in the US have been on the rise (The Committee for Greater LA et al., 2020). These conversations may be worthwhile to revisit as the utilization of the internet continues to increase and evolve. It also is important to note that the internet is here to stay and individuals who remain disconnected will continue experiencing significant barriers to accessing educational and social justice opportunities, both of which have implications for public health. With this in mind, there must be constant, critical evaluation of how to reduce unintended negative public health consequences, emphasize benefits, and continue to establish the internet as an accessible, affordable service for everyone regardless of sociodemographic factors.

Conclusion

Failure to address the digital divide has implications for conducting EJ work when the same communities disproportionately impacted by environmental injustices are also disproportionately impacted by digital inequities. Although progress has been made in the US, it must continue through establishing digital equity as an EJ issue, passing H.R. 1783 and other policies like it, and establishing digital equity as a social determinant of health. These actions will enhance capacity to understand and advocate for EJ, impact environmental health policy, and reduce, or even prevent, environmental health issues.

Meaningful next steps include advocating for policies like H.R. 1783 that improve digital equity, conducting research around digital equity in the context of EJ, establishing programs that

improve digital literacy for communities, continuing conversations with key stakeholders around broadband internet access as a social determinant of health and establishing the internet as a public utility, and engaging individuals, organizations, and communities who conduct EJ work to generate broad public support. Addressing digital equity is more important now than ever before with the COVID-19 pandemic shifting key resources and access to social justice online, a transition that is unlikely to revert back to pre-pandemic norms. Through achieving digital equity and ensuring everyone is able to access internet in their homes, the full potential of the internet can be realized in terms of improving EJ. Failing to achieve digital equity will only result in broader inequities, leaving those who remain disconnected far behind.

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References

- Ali-Hassan, H., Eloulabi, R., & Keethakumar, A. (2020). Internet non-use among Canadian Indigenous older adults: Aboriginal peoples survey (APS). *BMC Public Health*, 20(1), 1554. <https://doi.org/10.1186/s12889-020-09659-5>
- Anderson, M., & Kumar, M. (2019). *Digital divide persists even as lower-income Americans make gains in tech adoption*. <https://www.pewresearch.org/fact-tank/2019/05/07/digital-divide-persists-even-as-lower-income-americans-make-gains-in-tech-adoption/>
- Bauerly, B. C., McCord, R. F., Hulkower, R., & Pepin, D. (2019). Broadband access as a public health issue: The role of law in expanding broadband access and connecting underserved communities for better health outcomes. *Journal of Law, Medicine and Ethics*, 47(S2), 39–42. <https://doi.org/10.1177/1073110519857314>
- Benda, N. C., Veinot, T. C., Sieck, C. J., & Ancker, J. S. (2020). Broadband internet access is a social determinant of health! *American Journal of Public Health*, 110(8), 1123–1125. <https://doi.org/10.2105/AJPH.2020.305784>
- Bennet, King, Portman, Manchin urge Biden administration to create modern, unified federal broadband standard*. (2021). <https://www.bennet.senate.gov/public/index.cfm/2021/3/bennet-king-portman-manchin-urge-biden-administration-to-create-modern-unified-federal-broadband-standard>
- Biden, J. R. (2021). *Executive order on protecting public health and the environment and restoring science to tackle the climate crisis*. <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/>
- Breville, M. (2017). *The EPA-NIMHD pilot centers of excellence on environmental health*

disparities: A summary of accomplishments.

https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NCER&dirEntryId=338137

California Environmental Health Tracking Program. (2015). *Costs of environmental health conditions in california children*. http://www.phi.org/uploads/files/2015ROI_CEHTP.pdf

Centers for Disease Control and Prevention. (2020). *National environmental public health tracking*. <https://www.cdc.gov/nceh/tracking/>

Centers for Disease Control and Prevention. (2021). *Healthy people*.

https://www.cdc.gov/nchs/healthy_people/index.htm

City of Seattle. (2018). *Community needs survey*.

[https://www.seattle.gov/Documents/Departments/SeattleIT/DigitalEngagement/TechAccess/Seattle IT Connectedness Study_Mail Version.pdf](https://www.seattle.gov/Documents/Departments/SeattleIT/DigitalEngagement/TechAccess/Seattle%20IT%20Connectedness%20Study_Mail%20Version.pdf)

Coburn, J. (2005). Chapter 2. Street science: Characterizing local knowledge. In *Street Science Community Knowledge and Environmental Health Justice*.

Collins, S. A., Yoon, S., Rockoff, M. L., Nocenti, D., & Bakken, S. (2014). Digital divide and information needs for improving family support among the poor and underserved. *Health Informatics Journal*, 22(1), 67–77. <https://doi.org/10.1177/1460458214536065>

Cordner, A., Poudrier, G., Divalli, J., & Brown, P. (2019). *Combining social science and environmental health*. 1, 1–16. <https://doi.org/10.3390/ijerph16183483>

Cushing, L., Faust, J., August, L. M., Cendak, R., Wieland, W., & Alexeeff, G. (2015).

Racial/ethnic disparities in cumulative environmental health impacts in California:

Evidence from a statewide environmental justice screening tool (CalEnviroScreen 1.1).

American Journal of Public Health, 105(11), 2341–2348.

<https://doi.org/10.2105/AJPH.2015.302643>

Dailey, J. (2008). *Internet use and environmental justice: An exploratory study*.

<http://etd.lsu.edu/docs/available/etd-11102008-120141/>

Early, J., & Bustillos, D. (2018). An Internet for some threatens health for all: What effects could the repeal of net neutrality in the USA have on individual and population health? *Global Health Promotion*, 27(2), 109–113. <https://doi.org/10.1177/1757975918785354>

Early, J., & Hernandez, A. (2021). Digital disenfranchisement and COVID-19: Broadband internet access as a social determinant of health. *Health Promotion Practice*. <https://doi.org/10.1177/15248399211014490>

English, P. B., Richardson, M. J., & Garzón-Galvis, C. (2018). From crowdsourcing to extreme citizen science: Participatory research for environmental health. *Annual Review of Public Health*, 39, 335–350. <https://doi.org/10.1146/annurev-publhealth-040617-013702>

EPA Press Office. (2021). *EPA administrator announces agency actions to advance environmental justice*. <https://www.epa.gov/newsreleases/epa-administrator-announces-agency-actions-advance-environmental-justice>

Federal Communications Commission. (2015). *In the matter of protecting and promoting the open internet*. <https://doi.org/10.1145/3132847.3132886>

Federal Communications Commission. (2020). *E-Rate: Universal service program for schools and libraries*. <https://www.fcc.gov/consumers/guides/universal-service-program-schools-and-libraries-e-rate>

Federal Communications Commission. (2021a). *In the matter of establishing the digital opportunity data collection*. <https://www.fcc.gov/document/fcc-takes-next-step-collect-more-precise-broadband-mapping-data>

Federal Communications Commission. (2021b). *Emergency broadband benefit*.

<https://www.fcc.gov/broadbandbenefit>

Fiber Broadband Association. (2021). *Fiber for breakfast*.

<https://www.fiberbroadband.org/page/fiber-for-breakfast>

Fridsma, D. B. (2017). *Re: Request for comment – Actions to accelerate adoption and accessibility of broadband- enabled health care solutions and advanced technologies (GN Docket No. 16-46, FCC 17-46)*. <https://www.amia.org/sites/default/files/AMIA-Response-to-FCC-Notice-on-Accelerating-Broadband-Health-Tech-Availability.pdf>

Fuller, B. (2021). *Bridging the digital divide: Inequities in access to broadband and devices in the United States*.

Funes, Y. (2021). *Is internet for all actually good for the planet?* <https://atmos.earth/biden-infrastructure-plan-internet-climate/>

H.R. 1783 - Accessible, Affordable Internet for All Act, (2021).

[https://www.congress.gov/bill/117th-congress/house-](https://www.congress.gov/bill/117th-congress/house-bill/1783/text?q=%7B%22search%22%3A%5B%22internet+for+all%22%5D%7D&r=1&s=1#toc-H9036CF1887D54DE8B49A46AAFB97E2AB)

[bill/1783/text?q=%7B%22search%22%3A%5B%22internet+for+all%22%5D%7D&r=1&s=1#toc-H9036CF1887D54DE8B49A46AAFB97E2AB](https://www.congress.gov/bill/117th-congress/house-bill/1783/text?q=%7B%22search%22%3A%5B%22internet+for+all%22%5D%7D&r=1&s=1#toc-H9036CF1887D54DE8B49A46AAFB97E2AB)

Haderlie, S., & Weiss, D. (2015). *The benefits of broadband expansion to America's economy, education, and health*.

https://www.common sense media.org/sites/default/files/uploads/kids_action/broadband-benefits-report-final-draft-for-design.pdf

Haluza, D., Naszay, M., Stockinger, A., & Jungwirth, D. (2017). Digital natives versus digital immigrants: influence of online health information seeking on the doctor–patient relationship. *Health Communication*, 32(11), 1342–1349.

<https://doi.org/10.1080/10410236.2016.1220044>

- Healthy People 2030. (2020). *Increase the proportion of adults with broadband internet - HC/HIT-05*. <https://health.gov/healthypeople/objectives-and-data/browse-objectives/neighborhood-and-built-environment/increase-proportion-adults-broadband-internet-hchit-05/data>
- Howard, B., & Morris, T. (2019). *Tribal technology assessment: The state of internet service on tribal lands*. <https://dx.doi.org/10.2139/ssrn.3427547>
- Jain, V., Al Rifai, M., Lee, M. T., Kalra, A., Petersen, L. A., Vaughan, E. M., Wong, N. D., Ballantyne, C. M., & Virani, S. S. (2021). Racial and geographic disparities in internet use in the U.S. among patients with hypertension or diabetes: Implications for telehealth in the era of COVID-19. *Diabetes Care*, *44*(1), e15–e17. <https://doi.org/10.2337/dc20-2016>
- Jordan, L., Stallins, A., Stokes IV, S., Johnson, E., & Gragg, R. (2011). Citizen mapping and environmental justice: Internet applications for research and advocacy. *Environmental Justice*, *4*(3), 155–162. <https://doi.org/10.1089/env.2010.0048>
- Liu, J. (2011). Picturing a green virtual public space for social change: A study of Internet activism and web-based environmental collective actions in China. *Chinese Journal of Communication*, *4*(2), 137–166. <https://doi.org/10.1080/17544750.2011.565674>
- Marquez, B., Gonzalez, P., Gallo, L., & Ji, M. (2016). Latino civic group participation, social networks, and physical activity. *American Journal of Health Behavior*, *40*(4), 437–445. <https://doi.org/10.5993/AJHB.40.4.5>
- Mikati, I., Benson, A. F., Luben, T. J., Sacks, J. D., & Richmond-Bryant, J. (2018). Disparities in distribution of particulate matter emission sources by race and poverty status. *American Journal of Public Health*, *108*(4), 480–485. <https://doi.org/10.2105/AJPH.2017.304297>
- National Digital Inclusion Alliance. (n.d.). *Definitions: Digital inclusion*.

[https://www.digitalinclusion.org/definitions/#:~:text=Digital Equity is a condition,our society%2C democracy and economy.](https://www.digitalinclusion.org/definitions/#:~:text=Digital+Equity+is+a+condition,our+society%2C+democracy+and+economy.)

Neira, M., & Prüss-Ustün, A. (2016). Preventing disease through healthy environments: A global assessment of the environmental burden of disease. *Toxicology Letters*, 259, S1.

<https://doi.org/10.1016/j.toxlet.2016.07.028>

New York Times. (2021). *Biden agrees to bipartisan group's infrastructure plan, saying "we have a deal."* <https://www.nytimes.com/live/2021/06/24/us/joe-biden-news>

Office of Disease Prevention and Health Promotion. (2021). *Civic participation.*

<https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-health/interventions-resources/civic-participation>

Ong, P. M. (2020). *COVID-19 and the digital divide in virtual learning, fall 2020.*

https://knowledge.luskin.ucla.edu/wp-content/uploads/2020/12/Digital-Divide-Phase2_brief_release_v01.pdf

Pew Research Center. (2021). *Who has home broadband.*

<https://www.pewresearch.org/internet/fact-sheet/internet-broadband/>

Program on Reproductive Health and the Environment. (2021). *Program on reproductive health and the environment homepage.* <https://prhe.ucsf.edu/>

Scanlan, M. (2021). Reassessing the disability divide: Unequal access as the world is pushed online. *Universal Access in the Information Society*. <https://doi.org/10.1007/s10209-021-00803-5>

Schweitzer, E. J. (2015). *Digital divide.* Encyclopedia Britannica.

<https://www.britannica.com/topic/digital-divide>

Sieck, C. J., Sheon, A., Ancker, J. S., Castek, J., Callahan, B., & Siefer, A. (2021). Digital

inclusion as a social determinant of health. *Nature Partner Journals: Digital Medicine*, 4(1), 5–7. <https://doi.org/10.1038/s41746-021-00413-8>

Slatin, C. (2020). Environmental justice in the time of pandemic. *New Solutions: A Journal of Environmental and Occupational Health Policy*, 30(3), 160.

<https://doi.org/10.1177/1048291120963417>

Stevens County/Spokane Tribe Broadband Action Team. (2019). *Community survey for high-speed internet*. <http://georgia4h.org/wp-content/uploads/steven-county-comm-survey.pdf>

The Committee for Greater LA, USC Dornsife: Equity Research Institute, & UCLA Luscin: School of Public Affairs. (2020). *No going back: Policies for an equitable and inclusive Los Angeles*. https://secureservercdn.net/50.62.89.111/bj6.4b9.myftpupload.com/wp-content/uploads/2020/12/USC_ERI_no-going-back_policy_report.pdf

The White House. (2021a). *Fact sheet: The American jobs plan*.

<https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/>

The White House. (2021b). *Executive order on promoting competition in the American economy*.

<https://www.whitehouse.gov/briefing-room/presidential-actions/2021/07/09/executive-order-on-promoting-competition-in-the-american-economy/>

United States Census Bureau. (2019). *Annual estimates of the resident population for the United States, regions, states, and Puerto Rico: April 1, 2010 to July 1, 2019*.

<https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-total.html>

United States Environmental Protection Agency. (2019). *Toxic release inventory*.

<https://www.epa.gov/toxics-release-inventory-tri-program>

United States Environmental Protection Agency. (2020). *EJSCREEN: Environmental justice*

screening and mapping tool. <https://ejscreen.epa.gov/mapper/>

United States Environmental Protection Agency. (2021). *Environmental justice*.

<https://www.epa.gov/environmentaljustice>

Varshavsky, J. R., Zota, A. R., & Woodruff, T. J. (2016). A novel method for calculating potency-weighted cumulative phthalates exposure with implications for identifying racial/ethnic disparities among U.S. reproductive-aged women in NHANES 2001-2012. *Environmental Science and Technology*, *50*(19), 10616–10624.

<https://doi.org/10.1021/acs.est.6b00522>

Williams, E. (2011). Environmental effects of information and communications technologies.

Nature, *479*(7373), 354–358. <https://doi.org/10.1038/nature10682>

Wing, S. (1998). Whose epidemiology, whose health? *International Journal of Health Services*, *28*(2), 241–252. <https://doi.org/10.2190/Y3GE-NQCK-0LNR-T126>

Yakima Valley Community Foundation, & Yakima County. (2020). *Yakima Valley broadband action team*. <https://connectourvalley.org/>

Appendix A

Competency Chosen from Foundational & Concentration Competency List (To be completed at the beginning of the semester)	Specific Portion of Paper and/or Poster Creation & Presentation Synthesizing Competency (To be completed at the end of the semester)	Confirmed by Faculty Y/N
#19 Communicate audience-appropriate public health content, both in writing and through oral presentation	Development of a capstone paper that proposes digital equity as an environmental justice issue and related oral presentation, which is scheduled for Friday, August 13 th , 2021, as part of Health Professions Day for students in the Master of Public Health Program at the University of San Francisco.	
#6 Discuss the means by which structural bias, social inequities and racism undermine health and create challenges to achieving health equity at organizational, community and societal levels	Through my capstone paper, I examine the racial and economic disparities related to environmental justice and access to household broadband internet. These disparities create major challenges to achieving health equity at organizational, community, and societal levels. In my paper, I define how digital inequities have implications for access to healthcare, economic opportunities, and social justice.	
#7 Assess population needs, assets and capacities that affect communities' health	In my capstone paper, I outline how digital inequities in the context of environmental justice impact a community's ability to access environmental health resources, participate in communication platforms about environmental justice issues, and advocate for environmental justice issues by leveraging the power of the internet.	
#14 Advocate for political, social and economic policies and programs that will improve health in diverse populations	In my capstone paper, I advocate for the passage of the Accessible, Affordable Internet for All Act (H.R. 1783), which promotes digital equity and holds potential to improve health outcomes related to digital inequity when considering environmental justice issues in the United States. I also propose further discussion about digital equity as a social determinant of health and recommend further conversation about establishing broadband internet as a public utility.	
#15 Evaluate policies for their impact on public health and health equity	I evaluate H.R. 1783 in my paper to determine its ability to achieve digital equity in the United States in the context of	

	addressing environmental justice, which has implications for public health.	
#1 Apply moral, human rights, social justice, and/or legal principles to public health practice <i>(MPH Generalist Concentration Competencies)</i>	In my capstone paper, I focus on one area of social justice – environmental justice. I apply an environmental justice perspective to establishing digital equity, and also incorporate principles related to community based participatory research in which communities are considered credible experts when it comes to knowledge acquisition and decision making.	

Appendix B

Stakeholder Analysis						
Stakeholder Name (Organization)	Interest/Impact	Influence	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
<i>FCC</i>	<i>High</i>	<i>High</i>	<i>Regulating communications across the US.</i>	<i>Adopting rules that increase access and affordability of broadband internet.</i>	<i>Continuing to function on incomplete data to make regulatory decisions.</i>	<i>Continuing to provide more robust data related to broadband internet access for underserved and unserved communities.</i>
<i>Biden Administration</i>	<i>Medium</i>	<i>Medium</i>	<i>Promoting EJ.</i>	<i>Recognizing that digital equity is an important factor to address in terms of achieving EJ and addressing other social justice issues.</i>	<i>By re-prioritizing other administrative issues and de-prioritizing EJ and broadband internet access.</i>	<i>Applying public pressure on the issue and demonstrating how digital equity can align with addressing EJ concerns.</i>
<i>ISPs</i>	<i>Low</i>	<i>High</i>	<i>Meeting business objectives; Profiting from their business.</i>	<i>Prioritizing the expansion of broadband internet access for underserved and unserved communities.</i>	<i>Continuing to increase prices of broadband internet and not expanding to underserved or unserved regions.</i>	<i>Incentivizing their expansion to underserved or unserved regions through tax credits or other financial means.</i>

<i>EJ Organizations</i>	<i>Medium</i>	<i>Low</i>	<i>Addressing environmental injustices and advocating on behalf of affected populations.</i>	<i>By recognizing digital equity as a means by which to achieve their goals.</i>	<i>Not recognizing digital equity as an avenue by which to address EJ concerns.</i>	<i>Demonstrating digital equity as an EJ issue through research and media attention.</i>
<i>EJ Communities</i>	<i>Medium</i>	<i>Low</i>	<i>Addressing environmental issues in their community.</i>	<i>Agreeing that digital equity is a means by which to address EJ concerns.</i>	<i>Not recognizing digital equity as a means by which to address environmental issues in their community.</i>	<i>Educating the community on the opportunities available for greater civic engagement using the internet through social marketing, accessible research, and increased media attention.</i>
<i>US EPA</i>	<i>Low</i>	<i>Low</i>	<i>Protecting the environment and health in the US.</i>	<i>Understanding that promoting digital equity can help the agency align with the priorities of the Biden Administration; Ensuring that resources as they relate to environmental health provided online are accessible.</i>	<i>By not understanding the link between the digital divide and EJ; By continuing to create inaccessible resources on the internet about environmental health.</i>	<i>Applying public pressure towards the agency's support of improving digital equity as a means by which to address EJ; Recognizing broadband internet access as a social determinant of health.</i>