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Othering
& Belonging
Institute

Technology and the COVID-19 Era

How Artificial Intelligence Shapes
Futures of Othering & Belonging in an
Era of Pandemic and Protest

Nicole Montojo, Nicole-Marie Cotton, and Emnet Almedom

The Othering & Belonging Institute at UC Berkeley, formerly the Haas Institute for a Fair and Inclusive Society, is a vibrant hub of researchers, community leaders, policymakers, artists, and communicators that advances research, policy, and work related to marginalized communities. It engages in innovative narrative, communications, and cultural strategies that attempt to re-frame the public discourse around marginality and inclusion and respond to issues that require immediate and long-term action.

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Executive Summary

Many of us may remember Spring 2020 as a continuous loop of sifting through the firehose of new information about the pandemic on our Twitter feeds, Facebook feeds, or Whatsapp group chats. By Summer 2020, many were in the streets rising up against an epidemic of a different sort, of anti-Black police violence, and again processing collectively online. Other moments over the past year and a half are similarly marked by technology. To facilitate children's distance learning experience, families downloaded new, unfamiliar softwares; some to connect kids with classmates, some to aid similarly home-bound educators to monitor the work of dozens of students. In a time of confusion and uncertainty, algorithms were one of many tools to determine allocation of critical resources like pandemic relief funding, healthcare supplies, and vaccines. Many of these applications of technology existed before the pandemic, but their proliferation expanded since March 2020 and the impacts are yet to be understood.

What is less visible is the system of power and decision-making that operates in the background: the online quota systems surveilling the Uber and Amazon drivers shuffling us and our products around; the insular tech company decisions on how to categorize and moderate false health and political information on social media; the surveillance society being constructed by police and national security departments that invades personal privacy and criminalizes whole communities; the world of government procurement of automated systems to ostensibly improve delivery of health or education services. At the Othering & Belonging Institute, much of our work is rooted in unpacking this system of economic and political power and how othering and belonging are embedded within – now we are making a foray into doing so through the lens of technology.

This report provides an overview of the current public conversation as it relates to the ongoing COVID-19 pandemic and algorithm-based artificial intelligence used in three interrelated domains that impact public health and social equity: the use of automated decision systems, surveillance, and social media.

Our Key Takeaways

Any introduction of advanced technologies must be put in its historic, economic, and political context. This report is concerned with issues of equity in two realms: technology and health. Health is increasingly understood to be socially determined – as historic choices on how to structure work, neighborhoods, and social services all come into play when

investigating individual and community-level health outcomes. Similarly, technology's development is socially determined. Inequities perpetuated by technology cannot be divorced from an analysis of the tech industry's increasing economic, cultural, and political influence, not just in the United States, but across the globe. In investigating the role of automated decision systems, surveillance, and social media during the pandemic, we see many spaces where health equity and technology equity intertwine. Access to the internet is known as a social determinant of health and vaccine access has heavily relied on access to high-speed internet and digital literacy. The disproportionate surveillance of Black people on and offline has health impacts on Black activists and on Black people who witness viral imagery of Black death. During the pandemic, people of color in precarious work have been especially subject to surveillance tactics meant to boost efficiency, but at the cost of great physical and mental health impacts to workers. There is a vast and growing landscape of technologists, worker-organizers, students, and sociologists working – sometimes in tandem, sometimes against one another – to imagine a different future for the development of technology rooted in justice for all.

Using algorithms to allocate resources and determine access to care embeds patterns of the past rather than building for a future where care is a universal goal. Automated decision systems (ADS) are being used to determine who is deserving of access to critical systems that mark one's ability to participate in society, such as healthcare, credit, mortgages, health insurance, and public benefits, often with limited public oversight. ADS are also being used to justify intervention in communities that have been historically over-policed and over-surveilled. This mix of algorithms for gate-keeping and for targeting are tools that maintain historic social and spatial marginalization. In the context of COVID-19, the use of ADS to distribute critical pandemic relief funds revealed flaws in our ability to accurately and equitably predict need. The importance of designing race-conscious policy and clinical practice is complicated when designers of algorithms treat race as biology – a relic of race science. The allure of automating and "unbiasing" decisions through algorithms also sets the trap of attempting to silo race as a deterministic variable, rather than as just one indicator of whole systems of socially determined health, from labor exploitation to access to health insurance to the locating of testing and vaccination sites. Determining how a person is treated in a personal and collective health crisis is a grave decision; if algorithms are to play any role, we must carefully understand the causal relationships among the variables included. The failures of ADS in the early stages of the pandemic call us to rethink the type of power delegated to algorithms; the power to help us see patterns over time does not necessarily translate to the power to help us decide who deserves care. Finally, the scarcity mindset embedded in the question itself – who deserves care? – requires us to zoom out to the macro context of a medical system with deep roots in ableism, racism, and sexism. Algorithmic power to even achieve technical fairness in a siloed case like equitably distributing pandemic relief funding is contestable, but its limitations to drive us to broader goals of health equity are clear.

Concerns over surveillance range across several issues, including flaws within existing surveillance technologies, a potential end to individual privacy, and the growing reliance on carceral technologies as solutions to complex social problems. We must examine the narratives and systems that make turning to surveillance technology in our workplaces, public places, and digital spaces desirable and profitable. Profit-seeking technology companies and data brokers are interweaving data from employers, police-generated crime data, social media, and more; all to fuel systems of criminalization, deportation, and dehumanization. Public intervention is needed to ban flawed and dangerous technologies, such as facial recognition, and to clarify that government procurement of technology is a serious policy decision, not just a process of "modernization." Artificial intelligence (AI) increases the scale and invasiveness of surveillance through automation and new predictive capacity, but the tools simply evolve a timeless mandate to use state and corporate power to build structures that marginalize. Lastly, AI-powered surveillance is disrupting the very notion of individual privacy and emboldening state and corporate power to unacceptable levels to create a new non-public, non-private space. This hard-to-regulate space distracts from the imperative to engage the complexity of social issues like inequality and crime.

While much of this report's social media analysis is grounded in the spread of false information regarding the coronavirus pandemic, the roots are much deeper. The macro context concerns growing uncertainty in the midst of rapid social change and the fruits of a slow, strategic erosion of trust in government, in health and scientific institutions, and in each other. Social media manipulation's disparate impact on communities of color is tied to the way social media is structured itself: frictionless, optimized for engagement, and financially fueled by tech giants and content creators who learn the path to amplification. There is an opportunity to build on innovative uses of social media in its current form and confront the concentration of power in the creation and funding of social media. The future of social media, which drives much of our information ecosystem, will be defined by our ability to regulate the current structures, but also to create new structures that embody the values of a broader community.

In summary, across all possible paths forward, we must contest with power. Our existing levers of power via industry reform and government regulation can do more to address tech industry power run amok. The path ahead requires new modes of collectively creating technology, governing technology and data in the public interest, and organizing a bigger "we" of tech workers and tech users who can build these modes together. Our resourcing and ways of governing technology must honor the collective public investment that has created a society and culture shaped by technology. This collective investment ranges from the US federal government's early investment of capital into today's biggest tech companies to the labor investment of the lowest-paid tech workers across the globe.

Roadmap for this Report

Building toward a vision of technology rooted in justice first requires an analysis of how technology functions as a tool for othering and structural marginalization. Starting with our introduction, we examine the diverse field of people, institutions, and movements driving the work of shaping technology's role in society. In chapter two, we then ground our analysis in the understanding that technology is a product of society, with a specific political economy, and vast impacts on societal health and well-being. From there, three chapters examine how this dynamic plays out through one of three forms of technology: automated decision systems, surveillance, and social media. In each chapter, we introduce a case study of emerging uses of the technology specifically in response to the Covid-19 pandemic, which provides a lens for examining the broader scope of disparate health impacts and racialized inequalities that the technology produces. This is followed by an analysis of how this inequality is produced, identifying the key factors driving inequality related to the technology's design and/or sociopolitical context. Each chapter concludes by translating key takeaways from the analysis into recommended guideposts for conceptualizing paths forward in moving from technology for othering to technology for belonging.

Chapter five turns to the question of how different stakeholders and sectors are defining the path forward for advancing tech equity. We examine some of the possibilities for intervention in the realms of policy and government regulation, industry practices and product design, and culture. Within each realm, we explore proposed solutions with equity-related goals, which span a spectrum with ethical technology on one end, to emancipatory technology on the other.

In addition to this report, we commissioned a series of papers to do a deep dive into:

Contact Tracing and COVID-19
Protecting Activists, Protecting Privacy, Protecting Health

Christine Mitchell | Human Impact Partners

Leaving Surveillance Tech Behind in Higher Education
Towards Trust and Abolition

Shea Swauger | Librarian & PhD Student in Education at University of CO Denver

Policing Students Online
The Increasing Threat of School-Sanctioned Digital Surveillance

Jennifer Jones | ACLU Northern California
Ana Nájera Mendoza | ACLU of Southern California

Introduction

Algorithm-driven artificial intelligence (AI) and advanced digital technologies are restructuring society, catalyzing fundamental shifts across the multitude of systems that define how people relate to one another. Technology's influence on all spheres of life presents both immense opportunities and immediate threats to equity and public health. As the coronavirus disease (COVID-19) pandemic has rapidly increased our reliance on digital interactions, technology is providing a lifeline for connection; dissemination of key health information; and access to knowledge, essential goods, and services. Yet the pandemic, the 2020 protests and uprisings in response to systemic racial injustice, and global political turmoil have also exposed the urgency of technology-related threats. **From mass surveillance tools to social media platforms, these technologies are not only reinforcing existing systems of exclusion, but also producing new harms and injustices.**

To advance futures of belonging, we must understand the ways that advanced technologies are restructuring the processes of othering and belonging in the public, private, corporate, and marginalized (nonpublic/nonprivate) spheres of our society. How is technology reshaping the boundaries between each of these spheres within the circle of human concern, and consequently, who or what is relegated to the spaces outside of this circle? What does their marginalization mean for the future of humanity and society? And how can communities, government and nongovernment institutions, and corporations actively shape, rather than resign to, this future? Can technology be instead used to end marginalization and expand the circle of human concern?

Watch Circle of Human Concern explainer video

Research Questions and Scope

This report provides an overview of the current public conversation on questions about algorithm-based AI used during the COVID-19 pandemic in **three interrelated domains that impact public health and social equity: the use of automated decision systems, surveillance, and social media.** Through a review of recent academic literature, policy reports, popular media, and public convenings on these topics, as well as interviews with experts, practitioners, and advocates, we explore the following research questions:

How are experts, practitioners, and advocates across sectors defining challenges presented by AI and advanced technology? Specifically, how can technology be used to create or perpetuate racial inequity or other forms of marginalization? How are tech equity issues playing out during the pandemic, and what are the implications for public health?

How are different sectors defining the path forward for advancing ethical, equitable, and emancipatory uses of technology? What are the possibilities for engagement or intervention?

This landscape analysis is an initial part of a larger Othering & Belonging Institute research project on technology and equity. The broad overview of key issues presented here serves as a foundation for a series of commissioned writings and resources that take a more in-depth, focused look at specific applications and impacts of technology in particular spheres of society. Written by researchers, advocates, and practitioners with deep expertise, these pieces explore a range of emerging issues, including digital contact tracing, COVID-19 misinformation, carceral pedagogies in higher education, education surveillance technologies in K–12 settings, surveillance technologies in policing and immigration enforcement, and workplace surveillance in essential and gig work.

Defining Tech Equity and Artificial Intelligence

Public debates on tech ethics and equity have become more mainstream as technology's impacts on society become more visible, far-reaching, and urgent. Once considered a niche realm of technologists and scientific disciplines asking questions about a distant future, more of the conversation is now driven by social scientists, grassroots organizations, journalists, and dozens of research institutes and advocate networks oriented toward concerns of not just fairness but equity and justice. "Tech equity" has arisen as one of many buzzwords for this discourse, but it is

a subjective term, with no consensus over its definition. For some, tech equity may mean "doing no harm" through the use of technology. For others, it may involve a vision for technology that advances social justice and a critique of the power structures within the tech sector. Just as debates exist about the meaning, value, and use of concepts like equity, justice, and belonging, "tech equity" is a contested concept. Here, we use the term to refer broadly to the equitable design, use, and impact of technology on society. We also acknowledge that inequitable access to the internet and digital services and products—often referred to as the digital divide—is a long-standing social justice issue in Black and Brown communities; however, this landscape scan will focus on the impact of AI and information-based technologies. Similar to the evolution of the fight against the digital divide, the emerging criticism of AI's equity impacts has roots in the research and activism of those most impacted.

The discourse on tech equity is also inherently broad because the term "technology" encompasses so many different forms of scientific advancement. While the most visible conversations on tech equity are currently focused on AI and internet-based information technologies, the same questions and debates on equity extend to other areas such as biotechnology, synthetic biology, and medical and energy technologies that are beyond the scope of this paper. Here we choose to focus specifically on AI and information-based technologies as a critical entry point into issues of tech equity for two reasons:

Impact: AI systems have a unique role in othering and marginalization in that they are, at their core, "systems of discrimination" as researchers at the AI Now Institute at New York University explain: they are "classification technologies that differentiate, rank, and categorize," with impacts that are not evenly distributed across groups.[1] As AI has become increasingly embedded in social systems and public infrastructure, the differential impacts of discrimination shape a wide range of social determinants of health, thus driving wider disparities by race, ability, class, and gender. Moreover, AI is at the core of many forms of carceral technology—or tools that "are bound up in the control, coercion, capture, and exile of entire categories of people"—with newer AI-driven digital technologies continuing a long history of racialized surveillance and oppression.[2]

Urgency: AI and algorithmic bias are the central focus of many key stakeholders and institutions in the tech equity field, and where the debates on ethics, equity, and justice are actively expanding in spaces beyond the tech sector, and among marginalized communities—especially around issues of surveillance. AI and algorithms are at the core of issues of resource allocation, collective sense-making, and class hierarchy that have arisen during the pandemic, as the case studies show.

Julia Bossmann, director of the Foresight Institute and a member of the World Economic Forum's Global Council on Artificial Intelligence, offers a simple definition of AI, which is "making machines do things that we didn't

explicitly program them to do."[3] While traditional programming relies upon a set of rules and algorithms created by humans, AI allows computers to learn on their own without requiring humans to program every step of the process. As the next evolution of algorithm-driven technologies, this form of machine learning is known as "deep learning," because it uses multiple layers of deep "neural networks" similar to the human brain. "In our heads, we have all these neurons that are connected to each other and exchange information, and in a way, we are simulating this in machines," Bossmann explains. This report examines forms of technology that are considered AI (involving deep learning or machine learning) as well as the less advanced tools that depend on more basic algorithms and programming. New uses for both these types of technology are continuously emerging. The possibilities they open up are shaped by who is developing the technology, who the technology is for, and the values shaping the technology's objectives and regulation.

Facets of a Diverse and Disconnected Field

Reflecting on the range of possible futures shaped by technology, Erik Brynjolfsson, director of the MIT Initiative on the Digital Economy, states, "Neither outcome is inevitable, so the right question is not 'What will happen?' but 'What will we choose to do?' We need to work aggressively to make sure technology matches our values."[4] The answer depends on who is included in the "we" creating technology and what are considered "our values" that should direct technology's use in society. Part of this research is thus to understand who is currently shaping the public discourse on technology and equity. Whose voices are marginalized or excluded, and in terms of challenges and opportunities, who and what are these possibilities imagined for?

People, Institutions, and Movements Shaping the Landscape of Tech Equity

While there is no official, unified "field" of tech equity, we refer to the full range of stakeholders, organizations, and institutions engaged in these debates as the tech equity field. These stakeholders and groups exist across many disciplines and sectors, with varied relationships to the actual development of technology. Science, technology, and society[5] and public interest technology[6] are emerging as distinct academic and professional fields concerned with tech equity. Parallel but siloed conversations are occurring within different academic disciplines, from engineering and computer science to law and public health. Silos also exist by sector, with often separate discussions within government, nonprofit, and corporate institutions, as well as by the many narrow issue areas within technology.

Recognizing the need to bridge these conversations, numerous initiatives have begun efforts to build shared standards, language, analysis, visions, and spaces for this work. Prominent initiatives led by government and the private sector include the Obama Administration's Big Data and

Privacy Working Group;[7] the United Nations Secretary-General's High-level Panel for Digital Cooperation;[8] Partnership on AI;[9] and the Association for Computing Machinery's Conference on Fairness, Accountability, and Transparency (ACM FAccT).[10]

William Isaac, researcher at a Google AI start-up called DeepMind and cochair of ACM FAccT, describes the current state of the AI research field as just "beginning to grapple with broader systemic questions" in response to a greater understanding of the material harms and risks associated with machine learning.[11] This reckoning comes after an initial phase of "deep optimism" in AI as a solution to intractable social problems—or what communications and media scholar Fred Turner calls "digital utopianism."[12] Isaac and other leading voices within the tech sector have acknowledged the need to "build a collective muscle for responsible innovation and oversight," which requires processes to ensure that historically marginalized groups are "engaged in the process of technological design."[13]

Leading Critical Voices Challenging the Distribution of Power in Tech

While the tech industry is just beginning to address systemic racism, sexism, and other forms of inequity in its products and organizations, an established body of academic research, initiated primarily by Black women, has paved the way for an industry-wide reckoning. This includes the work of scholars like Safiya Umoja Noble, Sara Roberts, Ruha Benjamin, I'Nasah Crockett, and Sydette Harry, who theorized, foresaw, and directly experienced these issues long before they were acknowledged by policy-makers or industry leaders.[14] For example, in 2014, Black feminists like I'Nasah Crockett and Shafiqah Hudson exposed complex harassment and misinformation campaigns that employed digital blackface to impersonate Black women on Twitter and the online discussion board 4chan.[15] Crockett, Hudson, and other women collectively created anti-misinformation campaigns and implored Twitter and media companies to take "trolling" seriously. Now, it is better understood that "the very same forces that had been antagonizing them for years rebranded themselves as the alt-right."[16] Meredith Whittaker, director of the AI Now Institute at New York University, notes that technological harms were previously dismissed as "the byproduct of 'positive disruption,'" and many of the concerns raised by these scholars weren't taken seriously "until wealthy white men, frankly, in Silicon Valley began to feel some of these effects themselves."[17]

This dynamic reflects the extreme homogeneity and concentration of power within the tech sector among "spaces that in the West tend to be extremely white, affluent, technically oriented, and male. These are also spaces that have a history of problems of discrimination, exclusion, and sexual harassment."[18] These power structures define who has the power to create, scale, and profit off of AI technologies in contemporary society. At Google, women comprise just 10 percent of AI research staff at Facebook and Google, and Black workers comprise only 2.5 percent of the company's overall workforce.[19] The highly uneven distribution of power within the tech industry has come to light in recent years as whistle-blowers have

come forward with numerous cases of systemic racism and gender discrimination, including sexual misconduct, censorship, and retaliation against employees who have pushed the boundaries of tech equity conversations and organizing from inside the industry.[20]

Beyond just reforming the status quo, Ruha Benjamin calls for "investing in counterimaginaries"—seeding visions and infrastructures for liberatory forms of technology—noting that this capacity must be built "so we're not trapped in someone else's imagination."[21] This involves dismantling the structures that currently define "what social groups are classified, corralled, coerced, and capitalized upon so others are free to tinker, experiment, design, and engineer the future," and furthermore, "work[ing] with others to imagine and create alternatives to the *techno quo*—business as usual when it comes to technoscience—as part of a larger struggle to materialize collective freedoms and flourishing."[22]

Examples of Cross-sector Organizing

The push toward inclusion within the tech sector comes as pressure has mounted from the outside. Equity-oriented coalitions have grown in their reach and engagement in a range of issues regarding technology's impact on marginalized communities. While the surge in interest has recently brought many new stakeholders to the table, several key organizations—including the American Civil Liberties Union, Electronic Frontier Foundation, MediaJustice, and the Greenlining Institute—have seeded this work for over a decade. Today, many more nonprofit organizations whose missions are not specifically centered on technology's impacts now recognize its direct relationship to the issues they work on. Community-based movements for tech equity have been particularly effective in bridging organizations that are separately working on very distinct issue areas, such as immigration, policing, labor, housing, civic engagement, and public health, to name a few. In this moment that has laid bare technology's role in the hypersurveilling of communities of color, technology is increasingly seen as a key racial justice and civil rights issue.

As tech equity has become more of a mainstream concept, employees of technology companies have also been organizing, whistle-blowing, and joining with community-led movements. With a growing awareness of the ways technology is used to surveil and punish society's vulnerable populations—as well as their own responsibility and privilege—tech workers from inside Google and engineering students from top universities have used their power as engineers to take a stand against surveillance technology that may cause harm.

The ongoing #NoTechForICE campaign exemplifies this nascent form of expansive, cross-sector organizing. Coordinated behind the scenes by Mijente, a Latinx and Chicanx political organization for racial, economic, and gender justice, this campaign and related efforts brought together grassroots activists, immigrant rights advocates, tech workers, students, and university officials. #NoTechForICE launched in protest against the

Silicon Valley company Palantir's partnership with the federal Immigration and Customs Enforcement (ICE) agency. As a contractor, Palantir provided ICE with surveillance technology to aid in identifying, apprehending, and detaining undocumented immigrants.[23] Palantir employees circulated internal letters in protest of connections with ICE,[24] and by the end of the month, nearly 1,200 engineering students from seventeen of the top universities signed a pledge to not take positions at Palantir due to their partnership with ICE.[25] Student petitions became part of the #NoTechForICE hashtag to encourage tech workers to boycott large companies that provide technological services for ICE. Additionally, students at the University of California, Berkeley, advocated for institutional action, demanding that the university's Department of Electrical Engineering and Computer Sciences sever its ties with Palantir through the departmental Corporate Access Program, which brings companies into the university to recruit student talent.[26] This strategic organizing by students is rooted in the realization that "we are tech companies' recruitment pool, and we are valued by them, so our actions and our voices actually matter. They can be used to put pressure on these tech companies to change their actions."[27]

Guiding Analytical Frameworks

Technology as a Product of Society

Recent work by academics and public intellectuals has advanced the field's understanding of the dialectical relationships between technology, racism, misogyny, capitalism, and power.[28] Central to this analysis is countering the myth of technology and AI as neutral. Media studies scholars have highlighted how the cultural imagination of Silicon Valley celebrates technological spaces as progressive, postracial digital utopias,[29] despite race and racism being embedded in the tech sector's infrastructure.[30] While this discourse has led to greater acknowledgement of discrimination and inequality within the sector, technology itself is still often seen as a tool or "antidote" for correcting human bias,[31] often with good intentions to eliminate it. But because technological tools are imbued with the same biases that shape social inequality, they are not neutral or objective.

E. Tendayi Achiume, UN Special Rapporteur on contemporary forms of racism, racial discrimination, xenophobia, and related intolerance and professor of law at University of California Los Angeles, asserts that "technology is never neutral—it reflects the values and interests of those who influence its design and use, and is fundamentally shaped by the same structures of inequality that operate in society...Technology is a product of society, its values, its priorities and even its inequities, including those related to racism and intolerance."[32] The failure to acknowledge this is rooted in the ideology of "technological determinism," or the idea that while technology influences society, it is separate from and unaffected by social, political, and

economic forces.[33] The danger of technological determinism's "veneer of neutrality"[34] is that it "only serves to shield the forces that shape emerging digital technologies and their effects from detection and reform," Achiume explains. Any discussion of tech equity therefore must not be limited to technological tools themselves; it must include an examination of the dialectical relationship between technology and the social, political, and economic structures that it exists within and is shaped by.

The Political Economy of Tech

Inequities perpetuated by technology cannot be divorced from an analysis of the technology industry's increasing economic, cultural, and political influence, not just in the United States, but across the globe. The World Economic Forum describes AI and other emerging technologies as drivers of the "fourth industrial revolution."[35] This power is concentrated among a few private corporations and "super platforms" such as Microsoft, Apple, Amazon, Google, Facebook, Tencent, and Alibaba.[36] The largest tech companies, Google and Facebook, were sued by the US Department of Justice for violation of US antitrust laws in October 2020.[37] Google maintains a 92 percent global market share of internet searches, which as the US Department of Justice lawsuit asserts, makes it "a monopoly gatekeeper of the internet."[38] Facebook comprises two-thirds of the global social media market, and Amazon accounts for nearly 40 percent of all online retail activity globally.[39]

It is easy to forget that behind social media platforms and the mundane websites we use every day to purchase necessities like toilet paper and toothpaste on Amazon, users are engaging in publicly traded companies with the express purpose of maximizing profit for their shareholders. The primary resource from which they extract profit is *data,* which as a commodity has surpassed oil in value.[40] This data is created by users through a growing multitude of technologies that make up the ubiquitous "Internet of Things," or the full range of internet-connected devices embedded in everyday life that can collect and track data on consumer behaviors and preferences—including mobile phones, "smart" home devices like Ring doorbells, and wearable technologies with sensors that track a person's movements and health data. This data can be commodified and sold, as well as leveraged, to predict, encourage, or even manipulate consumer behavior through the design of technological platforms. The tech industry's accumulation of political, economic, and social power is therefore made possible through a massive computational networked infrastructure, which includes advertising technology, platform services, and a massive data-collection pipeline.[41]

Technology as a Social Determinant of Health and Belonging

This report is concerned with issues of equity in two realms: technology and health. How do these realms intersect, and why does technology matter for health equity? The public health concept of *social determinants of health* helps to illuminate their relationship. Social determinants of health are the societal circumstances in which individuals

are born and live that impact individual health and contribute to systemic health inequities across various axes of difference (race and ethnicity, gender and sexuality, social and economic class, immigration status, etc.). These include place-based conditions that determine access to basic needs (healthy food, housing, individual and community safety), opportunity (education, employment), and well-being (one's sense of security, autonomy, and belonging). As the cases examined in this report demonstrate, technology today directly influences all of these realms, with disparate impacts on groups that tend to exacerbate existing structural inequities.

Technology itself can therefore be understood as both socially determined and a social determinant of health, producing impacts on our material realities that manifest in myriad forms. Disparate access to technology and the internet, or the digital divide—which contributes to less access to information, educational opportunities, and employment pathways among low-income (both urban and rural) communities and people of color—is just one way that technology influences health. While attending to the digital divide may improve equity with regard to some social and health outcomes, it does not necessarily equate to the use of technology for holistic health and belonging, let alone eliminating technological harms.[42]

Health is just one—albeit fundamental—dimension of belonging, which we define as having the right to contribute to, participate in the design of, and make demands on social structures and institutions. Belonging, like health, is socially determined. Advancing technology for health and belonging requires more than closing disparities in access; it requires a fundamental shift in power as well as a vision for uses of technology rooted in justice. Beyond the reducing disparities associated with the digital divide, we consider how technology can function as a tool for either othering or belonging, and how its use for either purpose is shaped by systems of power. Therefore, central to this report is an analysis of how technology mirrors other social determinants of health, which, as stated by the World Health Organization, are "shaped by the distribution of money, power, and resources at global, national, and local levels."[43]

Embedding Institutional Barriers to Equity through Automated Decision Systems

With the development of information technologies that gather, track, aggregate, and analyze millions of individual-level data points on human behavior and outcomes, major institutions are increasingly employing algorithms in decision-making processes that determine an individual's ability to access essential public resources and services. While data-driven decision-making is not new, AI greatly expands the possibilities for new applications of algorithmic decision-making. Automated decision systems (ADS) employed by both public and private institutions are used to make immensely consequential determinations—for example, eligibility and access to welfare and social safety net programs;[44] pretrial bail,[45] probation, and parole;[46] health insurance and health care;[47] credit, financing, and related housing opportunities;[48] employment opportunities;[49] and much more—all which directly impact one's health, well-being, and upward mobility. Political scientist Virginia Eubanks explains that while society as a whole inhabits this "new regime of digital data," we don't all experience it in the same way:

> Most people are targeted for digital scrutiny as members of social groups, not as individuals. People of color, migrants, unpopular religious groups, sexual minorities, the poor, and other oppressed and exploited populations bear a much higher burden of monitoring and tracking than advantaged groups. Marginalized groups face higher levels of data collection when they access public benefits, walk through highly policed neighborhoods, enter the health-care system, or cross national borders. That data acts to reinforce their marginality when it is used to target them for suspicion and extra scrutiny. Those groups seen as undeserving are singled out for punitive public policy and more intense surveillance, and the cycle begins again. It is a kind of collective red-flagging, a feedback loop of injustice.[50]

Through algorithms' core function of efficiently and systematically evaluating whole populations, the consequences become much more than individual impacts, translating into deep systemic disparities and oftentimes reinforcing inequities against historically marginalized groups. Moreover "many don't know that they are being targeted, or don't have the energy, [material resources, community supports,] or expertise to push back when they are."[51]

While their data-driven, formulaic nature[52] may lead to the assumption that ADS are accurate and unbiased, these systems can only make determinations based on information inputs that teach or train them. The information the computers "learn" can be as problematic as the education humans receive formally or informally through interactions in society. If the information entered into an ADS is biased or inaccurate, the output will be laden with biased information—a dynamic commonly described in computer programming as "garbage in, garbage out."

But even when the data may be accurate or neutral, ADS technologies themselves are laden with values "learned" from the society they are created within, whether intentionally or unconsciously imbued by their human creators. Despite the common rationale for using ADS in social welfare programs as a means of "improving efficiency, doing more with less, and getting help to those who really need it," Eubanks explains, "[t]echnologies of poverty management are not neutral. They are shaped by our nation's fear of economic insecurity and hatred of the poor; they in turn shape the politics and experience of poverty."[53] As such, ADS that target the poor provide new ways of continuing long-standing institutional practices of "managing" poverty while "refram[ing] shared social decisions about who we are and who we want to be as systems engineering problems."[54] Machine learning researcher Harini Suresh points us to recognize that bias can be introduced across the lifespan of a model's creation—from the historical biases embedded in data to the selection of the indicators for a certain outcome of interest.[55]

The pervasive use of algorithms in arbitrating access to opportunity, resources, and basic needs means that these tools—and most importantly, those who develop and choose to apply them, as well as the assumptions and values their developers build in—hold immense power to shape public health outcomes as well as institutional responses to fundamental questions regarding distributive justice, civil and human rights, and whose lives are valued by society.

CASE STUDY

Disparate Health Impacts of "Optimizing" Distributional Decisions during the COVID-19 Pandemic

Across the globe, governments, technologists, medical researchers and practitioners, and public health experts are exploring the uses of algorithms and AI in response to the COVID-19 pandemic. Amy Abernethy, Principal Deputy Commissioner of the Food and Drug Administration, describes a number of ways algorithms are currently being utilized: to predict which COVID-19 patients are going to require intensive care unit treatment or a ventilator, to support the development and evaluation of medical products

and real-world datasets, and to predict areas where increased demand for drugs and other medical products may lead to shortages or other supply chain problems.[56] Researchers have also developed more advanced machine learning tools, such as a new AI diagnostic tool to detect asymptomatic COVID-19 infections through audio of coughs, which can be recorded and submitted through mobile devices.[57]

New Decision-Making Systems Reifying Old Patterns in Clinical Settings

While these sorts of tools are certainly promising, tech equity experts also warn of the potential acceleration of disparities during the COVID-19 pandemic through the use of "under-developed and potentially biased models" for clinical decision-making and resource allocation.[58] Such bias extends to models that have shaped policy decisions regarding the allocation of pandemic relief funding.[59] An article in the *Journal of the American Medical Association* suggests that the formulas used by the US Department of Health and Human Services (HHS) to determine distribution of $175 billion of federal funding to hospitals under the Coronavirus Aid, Relief, and Economic Security (CARES) Act resulted in a disparate impact on Black communities where relief funding is needed the most.[60] Kakani et al.'s analysis shows that because *past hospital revenue* was the most important factor within the HHS model, CARES Act funding to counties with higher shares of Black residents was not commensurate with their greater health and financial needs (measured by higher COVID-19 burdens, comorbidities, and worse hospital finances). In this case, revenue served as a flawed proxy for need, without accounting for the underlying reasons why these communities may spend less on health care—such as inadequate health insurance coverage and additional layers of biased decision-making systems that result in the undertreatment of Black patients—despite even higher need for care.[61] The authors argue that instead of relying on financial measures like hospital revenues, policy-makers and health-care providers must consider other measures of actual medical need, such as hospital strain, case counts, and prevalence of other health conditions that increase risks or severity of COVID-19.[62]

Health-care providers also commonly use algorithms in clinical settings impacting 70–150 million patients in the United States.[63] While intended to objectively optimize the allocation of lifesaving treatment, these algorithms in effect often favor white patients over Black patients. Similar to the CARES Act algorithm, bias in many such clinical ADS often results from the use of financial metrics as a proxy for need, as demonstrated in a study by Obermeyer et al. of a commercial risk-prediction tool that reflects typical methods used by insurance companies on roughly 200 million people in the United States each year.[64] In this case, the algorithm was used to target patients for "high-risk care management" programs, which provide additional resources and coordinated treatment by providers with the goal of improving care for individuals with complex health needs. To determine which patients would benefit the most, the algorithm relied on the problematic assumption that a patient's past medical expenditures

could predict future health-care needs, and that those with the highest expenditures should thus be targeted for the limited resources available through the high-risk care management program. The data on medical expenditures as well as the predictive model itself failed to account for the structural racial inequalities that shape health-care spending in the first place and, specifically, the reasons why Black patients on average generate lower costs than white patients. These include lack of access to adequate treatment (and relatedly, disproportionate access by white patients to higher quality or specialized care) and higher costs of care in areas with higher overall costs of living.[65] Obermeyer et al. identify multiple overlooked explanations for these disparities in health-care costs:

> First, poor patients face substantial barriers to accessing health care, even when enrolled in insurance plans…poverty can lead to disparities in use of health care: geography and differential access to transportation, competing demands from jobs or child care, or knowledge of reasons to seek care. To the extent that race and socioeconomic status are correlated, these factors will differentially affect Black patients. Second, race could affect costs directly via several channels: direct ("taste-based") discrimination, changes to the doctor–patient relationship, or others…For example, it has long been documented that Black patients have reduced trust in the health care system, a fact that some studies trace to the revelations of the Tuskegee study and other adverse experiences. A substantial literature in psychology has documented physicians' differential perceptions of Black patients, in terms of intelligence, affiliation, or pain tolerance. Thus, whether it is communication, trust, or bias, something about the interactions of Black patients with the health care system itself leads to reduced use of health care.[66]

These factors mask the reality of higher need for care among Black patients, resulting in the systematic disadvantaging of Black patients and widening health inequality through the allocation of resources to healthier white patients. While the model was "race-blind" in that race was not an input, it systematically assigned lower risk scores to Black patients compared to white patients who were equally sick.[67] The researchers emphasize that this algorithm is not unique; rather, it is "emblematic of a generalized approach to risk prediction in the health sector, widely adopted by a range of for- and nonprofit medical centers and governmental agencies."[68]

Examining Our Definitions of Race and Deservingness in Health Care and Beyond

ADS designers often describe their algorithms as objective or race-neutral if race is not factored in as a variable. However, other algorithms commonly include race in their models. A recent study published in the *New England Journal of Medicine* examines the use of race as an input in diagnostic algorithms to "adjust" or "correct" their outputs based on a patient's race or ethnicity, in effect propagating race-based medicine.[69] The study finds

that many of these race-adjusted algorithms disproportionately place Black Americans on the receiving end of inferior health care—cutting across multiple medical specialties and procedures, including childbirth, breast cancer treatment, thoracic surgery, kidney donation, and kidney failure—which subsequently exacerbates structural disparities by race within the health-care system.[70] For example, one algorithm used by cardiac surgeons showed higher risk of complications for Black patients who receive coronary artery bypass surgery, which could cause physicians to steer Black patients away from needed surgery. The study notes that several of these algorithms do not provide an explanation for racially disparate outcomes, while others offer rationales based on "outdated, suspect racial science or… biased data."[71]

Yet the likelihood of all of these outcomes—higher costs of care, greater risk of postoperative complications, or higher mortality rates—directly relates to the disproportionate lack of access to health insurance and care experienced by African Americans, not to mention historic patterns of bias and mistreatment by medical professionals when care is received.[72] All of these factors contribute to negative health conditions that may indeed involve higher costs or risks, but they are structural, rather than inherent to the patient. By accounting for these differences in terms of race, such algorithms treat race as a biological factor, thereby failing to recognize there is more genetic difference between individuals within a racial category than across racial categories while ignoring the root causes of these disparities and sociological factors correlated with treatment success. The authors argue that without accounting for these factors that shape the inputs or baseline conditions of individual patients, the algorithms' outputs reify the gap in overall health between Black and white communities, in addition to amplifying racial stereotypes:

> To be clear, we do not believe that physicians should ignore race. Doing so would blind us to the ways in which race and racism structure our society. However, when clinicians insert race into their tools, they risk interpreting racial disparities as immutable facts rather than as injustices that require intervention. Researchers and clinicians must distinguish between the use of race in descriptive statistics, where it plays a vital role in epidemiologic analyses, and in prescriptive clinical guidelines, where it can exacerbate inequities.[73]

When this data serves as an input in an algorithm, it reflects the bias of outdated models that suggest race is the *cause* of the inequality rather than intertwined with the true causes of difference, including socioeconomic factors and unequal care due to racism or, as the authors note, "the experience of being Black in America rather than being Black itself—such as toxic stress and its physiological consequences."[74] These nontransparent decisions are often made without the patient's consent or even awareness, meaning that doctors may steer patients away from lifesaving treatment based on their race without providing adequate information about all of the treatment options.[75] This mode of decision-making becomes even more problematic when it is up to the physician to

determine how a patient should be racially classified. The authors of the article ask, how would a Black Dominican patient be categorized by a race-adjusted algorithm? Would they be labeled as Black or Hispanic, and what impact would that have on the patient treatment recommendation? In the same vein, how would a white-presenting person of Hispanic heritage be classified? The assumption that race can be objectively assigned, as if it were an essential characteristic, fails to acknowledge that racial categories are socially constructed and constantly evolving, with different definitions in different places and times. Instead of supporting physicians in providing better patient care, the nonscientific use of race in medical algorithms and assignment of patients to racial categories lends itself to long-disproven race science.

A growing number of medical experts are calling for the removal of race from medical algorithms. One recent effort is specifically aimed at the removal of race in algorithmic assessments that are widely used to inform eligibility for kidney treatment and transplants, known as eGFR equations.[76] A 2020 study of over 56,000 patients found that removing race from the equation would have resulted in one-third of Black patients being diagnosed with a more severe form of chronic kidney disease than they were.[77] This has significant implications for the care of Black patients with chronic kidney disease, who are disproportionately affected by the condition and, based on the algorithm, would appear healthier than they actually are and thus delayed in being deemed eligible for specialty care or a kidney transplant.[78] Dr. Paul Palevsky, president of the National Kidney Foundation, has called for the medical field to address the racism and racial disparities embedded in nephrology care:

> of GFR, normalizes and reinforces the misconception of race as a biological determinant of health and disease. This is not to say that clinicians should ignore race and ethnicity. Doing so would blind us to the disparities and inequities present in health and healthcare. But we must not conflate the societal effects of race and racism on health, healthcare and kidney diseases with physiologic and pathophysiologic determinants of health.[79]

It is critical that medical ADS are audited for the use of faulty racial logics as well as indirect encoding of what sociologist Ruha Benjamin describes as "ableist, racist, and classist" logics, even when race is not explicitly considered. Benjamin points to a hypothetical scenario that is particularly relevant during the COVID-19 pandemic, in which an algorithm is used to determine whether or not a patient receives access to a ventilator by predicting their likelihood of survival:

> ventilator is someone who is more likely to survive by giving them the ventilator, you're using the person who is healthier and more likely to survive [as the benchmark], and you're building in the understanding that understanding into the algorithm, you're essentially automating eugenics…Wealthier, whiter, abled patients are more likely to get that scarce resource."[80]

A danger arises in the potential automation of such difficult decisions, which absolves humans of the burden of responsibility by transferring it to an algorithm. It automates what Benjamin describes as an "unthinking value of some kinds of people over others," or in other words, "a eugenic understanding of who deserves care and not."[81] The "unthinking" allowed by automation is particularly harmful in that it can create a "false sense of objectivity and fairness" without a rigorous examination of the AI models being used, thus allowing for "bias at warp speed," researchers from the Stanford University Department of Medicine warn.[82] In fact, a January 2021 study that systematically reviewed over 200 prediction models developed for diagnosing, evaluating prognosis, or assessing infection risk related to COVID-19 found that all of the models were rated at "high or unclear risk of bias."[83]

It is worth emphasizing that the "unthinking" that Benjamin speaks to extends beyond the passive acceptance of algorithms and technology; it also enables decision-makers to avoid confronting inherently inequitable notions of ableism in health care that have long preceded the use of clinical AI models. This is illustrated by the story of Michael Hickson, a forty-six-year-old African American man living with quadriplegia resulting from traumatic brain injury. As a COVID-19 patient at a Texas hospital, physicians denied him aggressive treatment for the virus, noting his low quality of life.[84] This decision—made by a medical team, not an algorithm—was not based on the need to ration care but the physicians' assessment that Hickson could not survive further treatment. Disability advocates and authorities on medical ethics across the United States have called for doctors to protect against the bias of underestimating disabled patients' quality of life, stating that because a disabled person's quality of life does not meet a normative standard, "that doesn't mean they should be triaged out of medical treatment."[85] If embedded within ADS along with biased data reflecting biased systems, inequitable biases in judgement—including unconscious bias that is entangled with ableism and racism—can be systematically reinforced in new ways and at unprecedented scale.

Key Factors Driving Racialized Health Inequities

The disparities produced by ADS used in institutions' pandemic response reflect the underlying problems built into ADS as a whole, which can be traced back to biased data and flawed models.

Biased Data

In addition to the flaws described above, the CARES Act funding allocation model relied on data that failed to accurately capture community health needs in the first place. Ziad Obermeyer, professor of health policy and management at the UC Berkeley School of Public Health, explains:

> …the obstacle is the data. The problem with AI in this setting is the problem with the rest of our [society's] response. People who want to get tested can't get tested; testing is unevenly distributed in society…This means that we don't see the epidemic where we need to see it. We look at poor communities, and we see there are higher COVID cases, and that's net of the [extreme] disparities in testing, but the [number of] COVID cases should be much higher. If we apply artificial intelligence to mine insights from this data, we are going to be automating biases and errors in our data collection processes, in other words, in our society.[86]

The lack of accurate data on COVID-19 in Black communities stems from local governments placing COVID-19 testing facilities in disproportionately white and affluent areas early in the pandemic.[87] The resulting testing data thus appears to show that these areas actually have higher infection rates and therefore higher need. This is contrary to the evidence that consistently shows people of color and lower-income communities are most deeply affected by COVID-19 cases and deaths. Obermeyer explains that this use of AI presents a "worst case scenario" that creates a "vicious cycle" of racial disparities by underfunding communities of color.[88]

The same systemic racial disparity has been well-documented in AI tools for law enforcement, such as algorithms to predict crime "hot spots" or to determine bail for inmates awaiting trial based on "flight risk." By using factors such as prior arrests and convictions, criminal records of relatives, and zip code or address, researchers find that the algorithms' decisions "reflect over-policing, the behaviours of law enforcement in Black and brown communities, larger patterns of socioeconomic disadvantage resulting from the racial caste system, rather than anything about the behaviours of people who are targeted."[89] Data out of context assumes a level playing field—for example, equal access to COVID-19 testing or quality health care, and equal treatment by law enforcement agencies or the justice system—while invisibilizing the systemic injustices that shape people's lived experiences.

Flawed Models

The health-care treatment and funding algorithms exemplify the problems with using AI in predictive models based on flawed inference, rather than true causality. Ziad Obermeyer acknowledges that while the lack of available data is a major challenge, it is possible to retrain algorithms to predict better measures of need. This "can make the difference between an algorithm that reinforces inequalities and an algorithm that fights against them. And that is important because as bad as algorithms can be, as much as they can reinforce these problems, it is a lot easier to fix a biased algorithm than a biased society, a biased doctor, or a biased health-care system."[90] There are cases that prove Obermeyer's point; for example, in response to findings that the several commercially available facial analysis systems perform significantly worse on women and individuals with

darker skin tones, "Microsoft and IBM reported that they had improved the accuracy of their facial analysis technologies along gender and racial lines."[91] However, this technical improvement may not be aligned with other social goals or may be used to advance social goals that are obscured when the focus is on technical possibilities. AI can play an important role in detecting, exposing, and addressing both human and algorithmic bias,[92] but greater clarity is needed on the limits of AI—what social problems it should not be applied to, what functions still require human oversight— and how these limits should be managed through both automated and human evaluation.

Implications

Examine the level of decision-making power delegated to machines.

As the name automated decision-making suggests, many of the examples highlighted here involve a delegation of decision-making—from allocating health-care resources in the COVID-19 crisis to determining bail in a pretrial setting. Many in the field of AI are inviting us to examine the inequitable impacts of these models, but also the level and type of power delegated to machines. Abebe et al. outline for us four roles for computing research (diagnostic, formalizing, rebuttal, synecdoche), which focus primarily on using computing to illuminate rather than dictate.[93] Similarly, Vyas, Eisenstein, and Jones advise us to "distinguish between the use of race in descriptive statistics, where it plays a vital role in epidemiologic analyses, and in prescriptive clinical guidelines, where it can exacerbate inequities."[94]

Acknowledge the history and bias of the inputs to automated decision-making tools.

ADS are popping up across our public functions.[95] Even before the proliferation of predictive analytics and automated risk assessments in our hospitals and child welfare systems, community-based groups have long spoken out against the harm of the systems themselves. In turn, the history and biases that predate these tools must be considered as powerful inputs to the future of the systems. Algorithms are being used to determine who is deserving of **access** to critical systems that mark one's ability to participate in society, such as credit, mortgages, health insurance, and public benefits, often with limited government oversight. Algorithms are also being used to justify **intervention** in communities that have been historically overpoliced and oversurveilled. This mix of algorithms for gatekeeping and for targeting are tools to maintain historic social and spatial marginalization.

Recognize the difference between achieving technical fairness rather than other social goals.

As Abebe et al. put it, we "run the risk of transforming a policy discussion into one about what is technically possible, rather than what social aims are ultimately desirable."[96] The push to delegate decision-making authority to algorithms can be driven by cost saving and efficiency goals as well as goals to equitably distribute resources. Disparate definitions of equity and technical "fairness" may complicate these goals and instead reify historic barriers to equity. There is a need to critically examine how technical tools and concerns of fairness enable society to avoid addressing the root causes of inequity. As Virginia Eubanks argues, "Like earlier technological innovations in poverty management, digital tracking and automated decision-making hide poverty from the professional middle-class public and give the nation the ethical distance it needs to make inhuman choices... [and] escape our shared responsibility for eradicating poverty."[97]

The Spectrum of Surveillance Technologies:
From Public Health Solutions to Pandemic Policing

While targeted surveillance of the poor and people of color has been a constant part of structural racism throughout history, AI increases the scale and invasiveness of surveillance through automation and new predictive capacity.[98] The growing use of facial recognition and other forms of biometric surveillance, especially by law enforcement and other government agencies, raises serious privacy, civil rights, and racial justice concerns. Along with other automated tracking tools such as drones and license plate readers, these methods amplify the capacity for surveillance in public spaces. The ubiquity of smartphones has given rise to new "mobile device forensic tools" that allow law enforcement agencies to comprehensively search data from mobile phones, demonstrating the possible use of technology to invasively surveil the private realm by accessing highly sensitive information from emails, texts, photos, applications (including location data), and more.[99] Police agency requests to tech companies to access user location histories, known as "geofence" warrants, have increased exponentially; Google reports an increase in requests by 1,500 percent from 2017 to 2018, and another 500 percent from 2018 to 2019.[100]

Kade Crockford, director of the Technology for Liberty Program at ACLU of Massachusetts, asserts that "artificial intelligence technologies like face recognition systems fundamentally change the balance of power between the people and the government."[101] This shift must be examined alongside the changing role and power of the technology industry. While vast sums of public resources are being invested in these technologies, private technology companies like Clearview AI, Palantir, Amazon, and others are leading their development—thereby profiting immensely through public-private partnerships and gaining access to multitudes of sensitive information in the process—as well as employing them for nongovernmental uses. Government and industry have deployed many of these tools without proper vetting, oversight, consent, or data security protections. The lack of standards combined with a lack of government regulation has resulted in significant mistakes,[102] data breaches,[103] and potentially illegal uses104 with real human costs.

Surveillance technologies have found new uses during the COVID-19 pandemic as public and private institutions across the globe seek solutions for controlling the spread of the novel coronavirus. Technologists and tech corporations now play a direct role in the public pandemic response through the shaping of public health interventions such as contact tracing. But beyond contact tracing, the current era of pandemic and protests has created an opening for testing numerous other tracking and surveillance technologies that rely on AI and ever-growing collections of data. While authorities have used public health and safety rationales to justify their use, many individuals and organizations have raised questions and concerns about how this moment may transform the future of public health, policing, and privacy.[105]

From Contact Tracing to Contact Policing

Contact tracing is a method of infectious disease control that aims to mitigate against a disease's spread by studying the way it is transmitted. Individuals who have been positively diagnosed receive help from public health workers on recalling the places they have gone and the people they may have come into contact with during the transmission period. Those individuals are then contacted and can take appropriate actions—including monitoring symptoms, seeking testing for infection or medical treatment, and self-isolating—to prevent further transmission.

The Proliferation of Digital Contact Tracing Tools

While this process has traditionally involved direct human interaction, governments are now working with companies to develop digital applications that may replace or complement manual contact tracing methods. The *MIT Technology Review*'s Covid Tracing Tracker has detailed the use of twenty-five different automated contact tracing tools currently backed by national governments while also finding over one hundred and fifty separate efforts in preliminary stages of development.[106] These applications typically employ GPS and Bluetooth technology to determine the geographical location of individuals who have or may be exposed to COVID-19. While GPS technology utilizes satellites orbiting the earth to track cellular tracking data, it does not narrow down a person's location to a unit small enough that could identify the likelihood of contact or transmission between two specific individuals. Bluetooth technology, on the other hand, depends on Bluetooth devices (such as smartphones) being close enough in proximity to transmit data. This allows for contact tracing at a much closer range and, thus, more accurate prediction of actual contact between specific individuals.

The US Centers for Disease Control and Prevention (CDC) believes that the automation of contact tracing through digital tools can improve traditional methods by allowing individuals to electronically self-report infections and

relying on location data to identify and promptly notify unknown contacts at risk of exposure. Automation improves overall comprehensiveness, accuracy and, thus, effectiveness of data collection and management without relying heavily on the exposed individual to remember who and where they went during a certain time period, which is subject to error.[107] In addition to these benefits, digital contact tracing allows for the use of AI and machine learning to analyze data on suspected or confirmed cases gathered from applications or other key sources, such as news outlets, ambulance activity, and hospitals. With this information, AI can detect hot spots and forecast how the disease will move. This can surface critical findings to inform public officials' decisions regarding response, recovery, and even long-term scenario planning for prevention and preparedness in the event of a future outbreak.[108]

Technological Limits Rooted in Lack of Public Trust and Abuses

While the CDC reports that there are privacy-preserving, proximity-sensitive technologies currently in development by many companies across the United States, public opinion surveys indicate these technologies raise significant privacy concerns. The Pew Research Center reports that Americans are largely divided over the acceptability of the government using cell phone data for contact tracing, with only 52 percent saying that it would be at least somewhat acceptable for the government to track locations of people who have tested positive for COVID-19 to understand the spread of the virus. Even fewer (37 percent) would support the use of tracking to ensure compliance with social distancing regulations. Past Pew surveys also indicate that the vast majority of Americans (81 percent) believe that potential risks of large-scale data collection by companies and the government outweigh any benefits, though very few (4 to 6 percent) report understanding what companies or the government do with the data collected about them.[109]

These sentiments likely present a significant barrier for voluntary adoption of contact tracing applications, which may limit the efficacy of such tools. A University of Oxford study found that a population would need approximately 60 percent of the population or 80 percent of smartphone users to use a contact tracing app to suppress the COVID-19 pandemic without any other form of intervention.[110] Amid growing skepticism around data privacy and overreach of government in personal lives, no country has successfully achieved the necessary usage rate. Even in Singapore, where there is strong trust in government policy acting for the common good, only 25 percent of the population had downloaded and used the government-sanctioned contact tracing application.[111] However, the researchers note that even at lower rates of uptake, digital contact tracing can still reduce the number of COVID-19 infections and deaths.[112]

The Oxford study's findings highlight the importance of government leadership in establishing a regulatory framework and coordinated response that engenders public trust. Researchers at Harvard University affirm that digital contact tracing and other technological solutions

cannot "solve" the pandemic on their own, and without a foundation of effective government coordination of their use, such technologies will not be voluntarily adopted by the public and, thus, ineffective.[113] They point to the need for government assurance of privacy controls that include fully voluntary use, robust data security, deidentification, and verifiable retention, in addition to a consistent effort toward building trust in government:

> Tracing and containment must work hand in hand with building trust in institutions and governance bodies to increase adherence, and to make enforcement more of a social enforcement possibility than a top-down security effort. This can come only through a concerted effort at consistency, transparency, and scientific accuracy in messaging from institutional players, with practical guidelines and clear recommendations…In order to drive voluntary adoption, it needs to be clear to people that a technical solution will actually help solve the problems they're experiencing and witnessing around them. Without a centralized decision maker providing a coordinated response that includes both containment of the illness and support—both for those diagnosed as positive and for those struggling in other ways due to the cascading effects of the pandemic—these tools will not be adopted, and will not be able to collect sufficient data for smart testing.[114]

The US pandemic response and regulatory framework for mitigation technologies, however, is far from clear. As with most emerging technologies, no government agency has clear jurisdiction over contact tracing applications, leaving their use highly unregulated. The vacuum created by the lack of a national standard or regulatory framework has been filled by an unworkable network where the Health Insurance Portability and Accountability Act of 1996 (HIPAA) applies only in some cases.[115] Because HIPAA is specifically designed to regulate medical institutions, its applicability to tools developed and implemented by tech companies—which are governed by a different set of consumer regulations, but whose tools may indeed draw from patient data and reports from HIPAA-regulated institutions—is a legal grey area. In Spring 2020, there were various proposals from Democrat and Republican senators to address gaps in privacy law for the flurry of digital products introduced, such as the COVID-19 Consumer Data Protection Act (S.6633), which would clarify privacy and consent requirements for digital contact tracing applications and delegate enforcement to the Federal Trade Commission and state attorneys general.[116] But some of the bills had serious flaws and gaps, and none of them made any headway in Congress. While the the COVID-19 Consumer Data Protection Act would have required applications to (1) allow users to opt-out of data collection and employ the right to be forgotten,[117] (2) deidentify personally identifiable information when no longer being used for a health emergency, and (3) obtain informed consent to collect data from the user and be clear on how the data may be shared with other parties, it would not have protected users from the company selling either the geolocation or personal health

information collected by the app for marketing purposes.[118] In reflecting on the fizzling out of privacy bills and contact tracing apps, the Brookings Institute calls for "clear and enforceable privacy rules across the entire marketplace, one that protects our personal information in good times and in times of crisis."[119]

Without government protections to prevent misuse or monetization of personal data gathered by contact tracing applications, breaches of privacy have already occurred. For example, a privacy audit of North Dakota's contact tracing application, Care19, found that the application's developer shared private user data—including unique identifiers and location data—with third-party apps Foursquare and Google.[120] This was in direct violation of the application's privacy policy, which communicated to users their data would be securely stored and not shared with other parties unless consent is given and compelled under regulations. Moreover, without a centralized, federal effort to develop a contact tracing application in the United States, similar to quarantine policies, states are left to individually decide if they will implement the technology and separately manage data security and logistical problems.[121] A fragmented state-by-state effort also limits the technologies' effectiveness by hindering contact tracing across state borders and consistent methods of data collection that are essential for a coordinated, evidence-based response.[122]

The challenges and risks associated with digital contact tracing once again demonstrate the importance of approaching the integration of technology through a sociotechnical lens. The work involved in scaling the effective, ethical use of emerging technologies is not solely technical, but a political project. Furthermore, as researchers studying the use of digital contact tracing tools warn, these technologies cannot be treated as a panacea that can entirely replace the human element of public health intervention or investment in a broader range of less-tech-intensive solutions.[123] Rather, to be effective, they must be integrated within a broader strategic response that ensures a functioning health-care system, which includes shelter-in-place policies; adequate hospital capacity; and production of protective equipment, tests, and treatments.[124]

Check out this blog from our partners at Human Impact Partners, examining the history of contact tracing and their recommendations for equitably integrating digital contact tracing into our public health response.

Disparate Impacts of Expanded Pandemic Surveillance on Communities of Color

Numerous privacy experts have spoken out about the long-term privacy threat that pandemic surveillance tools may unleash. Joseph Cannataci, United Nations special rapporteur on the right to privacy, states that the danger is that measures brought in to protect citizens in exceptional circumstances, when most people accept they are needed, could outlast the current crisis. "Any form of data can be misapplied in incredibly bad ways…If you have a leader who wants to abuse the system, the system is there," and it can target members of ethnic or religious minorities, exposing them to the risk of violence and discrimination, Cannataci asserts.[125]

The application of digital contact tracing technology already tends to target marginalized populations. For example, because congregational living spaces are high-risk places for infectious disease transmission, the CDC reports that facilities that house many people are a priority for contact tracing. These include correctional facilities, group homes, homeless shelters, long-term care facilities, and crowded multigenerational housing.[126] Many of these facilities have a disproportionate number of racially and socially marginalized individuals (Black and Latinx people) and medically sensitive individuals (elderly people and individuals with preexisting conditions). Another example is found in society's expanded dependency on low-wage essential workers—from delivery drivers to warehouse workers—whose jobs increase their likelihood of not just exposure to the virus, but also surveillance in the workplace. Lastly, amid the convergence of COVID-19 quarantine tracking and contact tracing with nationwide protests during the summer of 2020, there has been a concern for how this technology is combined with facial recognition to enable surveillance of communities by law enforcement agencies.

While the stated goal of contact tracing and other pandemic mitigation technologies may be to ensure public health and safety, their disproportionate use in surveilling marginalized populations equates to disproportionate policing and punishment. The following cases demonstrate how surveillance has expanded as a tool for social control since the beginning of the pandemic in essential workplaces, in public spaces, and in digital spaces.

Workplace Surveillance

Some companies have required employees to wear Bluetooth-operated contact tracking devices that monitor coworkers' proximity to one another and alert users when they do not maintain the recommended six feet of distance to prevent the spread of COVID-19.[127] Along with other devices like temperature-monitoring bracelets or remote sensing thermometers that transmit body temperatures,[128] these technologies pose disparate privacy risks and social impacts of health status disclosure (victim-blaming, harassment, and discrimination) to certain workers[129]—particularly essential workers and those who are unable to

work from home, who are disproportionately women, people of color, and low-income.[130]

Amazon has employed contact tracing technology to enforce social distancing of their warehouse workers, penalizing them for violating the six feet of separation.[131] Penalties could result in negative consequences such as marks on their record, lower morale, greater worker anxiety, and loss of employment.[132] An Amazon employee pointed out that this surveillance unfairly targets lower-wage workers, such as warehouse workers who perform manual labor, while managers at the same facility are not similarly penalized, let alone surveilled, for violating social distancing.[133] These workers often do not have a choice in being subject to surveillance, especially if they must continue working to earn a living despite the ongoing pandemic, as Ben Winters of the Electronic Privacy Information Center explains.[134] Furthermore, relying on surveillance to manage the pandemic fails to address the underlying health and safety concerns— instead placing the burden on workers to stay safe, despite lacking the appropriate resources, rather than employers taking the responsibility to protect their workers through systematic changes to operations.[135]

These digital contact or social distancing tracking tools are simply the latest form of targeted surveillance and policing by Amazon. An Open Markets Institute report calls the e-commerce giant "first and foremost a surveillance company. Data collection is the core of its business model... Amazon surveils consumers, competitors, citizens, and immigrants, and it invasively and ubiquitously surveils its employees."[136] The company's use of social distancing tracking reflects its general practice of intense tracking of worker behavior and punishment for failing to meet harmful expectations of productivity.[137] Amazon has also come under criticism for using predictive analytics to identify and monitor locations where employees are most likely to unionize.[138] As the parent company of the Whole Foods Market chain, Amazon has created an "interactive heat map" to visualize the risk of union organizing at Whole Foods Market locations based on factors such as percentage of families near the poverty line, workers' compensation claims, racial diversity, and employee turnover.[139]

This monitoring of employee behavior to observe likelihood to unionize has been happening long before AI has been available. The use of technology, which copies human thought patterns and applies them to large employee databases with multitudes of data on employees across hundreds of store locations, makes surveillance and decision-making easier for the company. Technology like Bluetooth contact tracing increases the possibility of invasive monitoring of employee-to-employee interactions to further suppress and punish unionizing efforts. Technology thus exacerbates the imbalance of power between workers and corporate

Check out this piece from our partners at Human Impact Partners on the health and societal impacts of workplace surveillance of warehouse workers and rideshare drivers.

employers while enabling companies to obfuscate responsibility for unfair labor practices and workplace conditions that pose serious public health threats.

Facial Recognition and Mass Surveillance of Public Spaces

In Detroit, advocates from the Detroit Community Technology Project have documented the Detroit Police Department's use of its mass surveillance system to monitor compliance with social distancing orders, which has resulted in the issuing of over 1,700 tickets with fines of up to $1,000 each in a city whose population is over 80 percent African American and where the median income is under $30,000.[140] The city's surveillance program, Project Green Light, is a $20 million public-private partnership that utilizes facial recognition technology in combination with nearly 700 cameras installed throughout the city as well as mobile cameras. While the program began in 2016 with cameras located at gas stations to "deter, identify, and solve crime," the cameras now exist in a range of public spaces, including medical centers, pharmacies, grocery stores, community centers, public and privately owned low-income housing, and even churches and schools.[141]

Mass surveillance of large cities has sparked lawsuits to protect citizens' biometric data. In October 2020, the ACLU of Northern California and Electronic Frontier Foundation filed a lawsuit against the San Francisco Police Department (SFPD), claiming that the agency violated San Francisco's own surveillance ban, Ordinance 107-19, which prohibits government agencies' use of surveillance tools without prior approval from the Board of Supervisors except for emergency situations. The plaintiffs presented records showing that SFPD requested and received access to the Union Square Business Improvement District's network of over 400 cameras in Union Square, which the department used to obtain real-time footage of the summer 2020 protests following the police killing of George Floyd in Minneapolis.[142] Hope Williams, the lead plaintiff in this lawsuit and a protest organizer, condemned SFPD's covert actions, stating: "It is an affront to our movement for equity and justice that the SFPD responded by secretly spying on us. We have the right to organize, speak out, and march without fear of police surveillance."[143]

These examples demonstrate how technology is used to further a long history of targeted policing, criminalization, and mass incarceration of Black and Brown people in the United States. Vulnerable communities bear the burden of criminal fines and penalties, as well as potential admission into criminal databases without access to legal recourse against unjust charges. These consequences become additional barriers to opportunity, employment, and economic stability, thus widening racial and economic disparities. Meanwhile, public institutions have become increasingly organized around carceral systems, for example, by relying on criminal fines and fees as a source of revenue.[144] Technology has further enabled this, proving profitable for both law enforcement agencies and technology companies. For example, the Brennan Center for Justice reports that under New York Mayor Michael Bloomberg, the New York Police Department

(NYPD) partnered with Microsoft to develop license-plate-reading cameras to track residents and their cars. As part of the business agreement, the City of New York would receive a portion of the profits whenever Microsoft licensed the technology to another city.[145] The NYPD has also directly enabled the development of new surveillance technologies by providing companies like IBM with vast amounts of surveillance data to train new tools, including facial recognition devices.[146]

Check out our panel event on The Surveillance State, Social Safety, and Building Power with campaigners, organizers, and advocates

Social Media Surveillance

With online networks being social in nature, societal power relations transfer over to these digital spaces. Similar to the Federal Bureau of Investigation's (FBI's) history of targeting and surveilling Black activists during the civil rights movement, the same federal agency has used social media platforms to target, surveil, and censor Black activists, whom the agency labels "Black identity extremists." Some Black social media users report being temporarily kicked off of the platform—colloquially called "Facebook Jail"—or allowed fewer posts after posting about issues affecting Black experiences like online or offline anti-Black harassment or affirming pride in Black identity.

Media Justice, a New York-based organization, has led the charge in advocating for better transparency on the surveillance the FBI is collecting on Black activists on Twitter. In March 2019, the organization joined the ACLU in filing a Freedom of Information Act suit against the FBI after a 2017 leak exposed that the agency had identified Black-led social movements protesting police brutality as "Black identity extremists." Media Justice stresses that this focus by the intelligence agency criminalizes organizations advocating and organizing for civil rights on online spaces and obscures the real threat that white supremacists pose to the safety of the nation. To contextualize the amount of data that is collected on Black online users, Media Justice estimates around 18,000 pages—nearly as many FBI files are known to exist on Dr. Martin Luther King Jr.'s political and organizing work.[147]

The impact of being labeled a "Black identity extremist" has serious consequences as it carries a "terrorist" designation. Media Justice points out that there has been no confirmed connection between Black groups or individuals on social media and terroristic threats, yet there are clear connections between white supremacist groups who organize and disseminate information online and numerous US domestic terrorist attacks as seen in Charlottesville, North Carolina; synagogue shootings in Poway, California, and Pittsburgh, Pennsylvania; and the church massacre in Charleston, North Carolina. Moreover, white supremacist groups are not given the designation of "racially motivated violent extremism" and as a result are not tracked as Black activists are, wrongfully labeled, and

surveilled. The leaked FBI files also determined that groups were targeted more than known terrorist group Al Qaeda. Besides the lawsuit against the FBI for transparency in Black activist surveillance, Media Justice asks the public in their #ProtectBlackDissent campaign to respond to their call to action by using the very same social media platforms used for surveillance, to tweet and interact with members of Congress.

Implications of Mass Digital Surveillance

In a study done after Edward Snowden's revelations of government surveillance, researchers found that when research participants received subtle reminders of government surveillance, they were more likely to self-censor their nonconformist options.[148] Counterintuitively, self-censure was highest among subjects who felt government surveillance was for the good of all.[149] The increase in self-censure when primed for government surveillance has implications for a healthy democracy, where individuals should be free to express a diversity of perspectives. Moreover, if Black-identifying individuals encounter a disproportionate amount of online surveillance, the ability to express discontent with the status quo, find solidarity with people who face similar daily challenges, organize groups, and advocate for civil rights becomes stifled if, like the study shows, they are more likely to self-censor themselves due to awareness of being the target of heightened surveillance.

Key Factors Driving Unjust Outcomes and Structural Marginalization

Concerns over surveillance range across several issues, including flaws within existing surveillance technologies, a potential end to individual privacy, and the growing reliance on carceral technologies as solutions to complex social problems. Here we examine the elements of surveillance technology that contribute to disparate racial impacts.

Fundamentally Flawed Technologies

Numerous studies have found that AI models frequently do not work as intended when attempting to recognize or identify women and darker-skinned individuals. A study by leading researchers of algorithmic bias, Joy Buolamwini and Timnit Gebru, found that commercial facial recognition technologies had error rates as high as 34 percent for darker-skinned women, while light-skinned men were not misidentified more than a rate of 0.8 percent.[150] Another systematic study of over 180 facial recognition algorithms by the National Institute of Standards and Technology found many algorithms are far more likely to inaccurately identify photographs of Black or East Asian faces (especially images of Black women), compared to white faces—some up to 100 times more likely to accurately identify a white face.[151] This is in part due to the fact that data used to "train" the AI often fails to represent the full diversity of the human population.

Despite these known flaws and lack of rigorous testing, law enforcement agencies have utilized facial recognition for over 20 years.[152] This can have serious consequences for nonwhite individuals, such as the case of Robert Williams, a Black man from Michigan who was wrongly detained by the Detroit Police Department after being misidentified by the agency's facial recognition software, despite verified evidence he was not the suspect in the surveillance video.[153] When Williams was arrested, he was not asked any questions or if he had an alibi by police,[154] nor was he given a reason for the arrest.[155] This direct violation of Robert Williams's rights is also a manifestation of what the AI Now Institute at New York University calls representational harms: "harms caused by systems that reproduce and amplify harmful stereotypes, often doing so in ways that mirror assumptions used to justify discrimination and inequality."[156] Rashida Richardson of Rutgers University and former director of policy research at AI Now points to the example of how racially biased and flawed technologies reinforce the stereotype of Black and Brown communities being more prone to criminality.[157] In the long term, this further enables the use of carceral technologies[158] and can force or completely [remove from] the table other types of reforms that community members are asking for… without looking at the structural concerns [and asking] whether or not technology is the right approach to fixing those problems."[159]

Increased Corporate and State Power to Surveil Marginalized Populations

Flawed and inaccurate surveillance technologies are an element of the problem, but inequity perpetuated by surveillance is not simply a technological issue. "We often say that [facial recognition] is dangerous when it's wrong, but it's also dangerous when it's right," states Esha Bhandari, a senior staff attorney with the ACLU Speech, Privacy, and Technology Project. It is also an issue of power and individual rights— who has a choice when it comes to being surveilled, and who has no option to reject it. "If we got to a world where facial recognition accuracy is improved—and I have no doubt that the private sector is working to respond to the critiques—a world of more accurate facial recognition has as pernicious an effect on communities of color because it enables widespread surveillance, enables identifying people at protests, people's associations and where they go, [especially] in neighborhoods that might already be overpoliced."[160] Bhandari's concerns are grounded in reality. In response to the findings in Buolamwini and Gebru's study, IBM spent nine months "substantially increasing the accuracy of its new Watson Visual Recognition service for facial analysis."[161] In order to beef up its face unlock feature's ability to accurately identify "a diverse set of faces," Google allegedly contracted out to a company that explicitly targeted homeless people with darker skin tones.[162] But there are less headline-grabbing and opaque tactics that corporations use to strengthen the tools that surveil us.
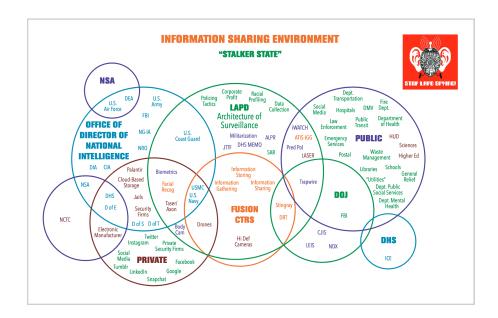
Both private companies and government agencies have turned over information on consumers or service users in their databases for research to better train computers. Facebook has come under scrutiny for selling

data from users' photos to companies like Clearview. Law enforcement has also used photos from their records to teach computer programs how to recognize an image as a human face and match that face to a particular identity. Facebook users and those in government databases are not informed when their images are used to build algorithms and to generate profits. As Jack Poulson, a former research scientist at Google, notes, "With a corporate partnership, there comes to be a lot of secrecy. The tech companies are not transparent about who has access to the data they collect or how they access training data for their products."[163] Consumers' private information is being used to "teach" machine learning technology how to recognize human faces, how to microtarget advertisements, and more. In human subjects research, researchers must seek out informed consent from participants in order to use participants' private information for their research purposes. This is seldom the case in the traditional methods that tech companies use to acquire training data for their machine learning technologies. The debate on how the medical community's doctrine of informed consent should transfer into computer scientists' understanding of their ethical responsibility to end users is nascent and has focused on cases where machine learning is used directly in a health-care setting.[164]

While the ethical debate on consent and privacy in product development plods along, the technical capacity to source data in new ways continues to explode with little regulation. In addition to the ever-expanding sources of data for tools of surveillance, the linkages between surveillance tools themselves are becoming more and more sophisticated. As Poulson notes, "There's data and who moves the data and owns it. Data you thought was in your doctor's office is now in a police database and can be linked to other information. AI and machine learning have created interoperability, making it possible to move data seamlessly. Once captured electronically, there's very little control over understanding where it goes or where it's been."[165] This phenomenon plays out in different scenarios where marginalized communities are already the most vulnerable—from immigration enforcement and local policing to housing—and where there is profit to be made off of mass amounts of data of interest to the state. For example, Mijente's #NoTechForIce campaign has exposed a network of web server hosts, consulting firms, software analytics firms, and data brokers that track immigrants subject to the control of ICE.[166] These profit-seeking tech and data companies are interweaving data from employers, police, and social media to fuel the US immigration system's deportation machine. These webs of interconnected data use ever-more advanced technologies, but they are simply evolving a timeless mandate for using state and corporate power to build structures that marginalize. As the Stop LAPD Spying

Check out our podcast where Jacinta González, an organizer with Mijente, explains how ICE and other law enforcement agencies are using surveillance technologies to target immigrant communities and other communities of color.

Coalition demonstrates in its **Stalker State map**, the entities with interest in surveillance preexist the technologies themselves and range from universities to state intelligence agencies to the military.

Implications

Procurement of technologies, entering into data-sharing agreements, and other seemingly innocuous efforts to "modernize" public services are policy decisions.

With the current capacities of the public sector, digitizing often means privatizing. We see this in the examples of digital contact tracing being outsourced to start-ups and in the contracts with Palantir, Microsoft, Amazon, and data brokers in the work of criminalizing immigration. Most immediately, this points us to the importance of treating procurement and vendoring of technology systems as policy choices with equity impacts. Looking longer term, the reliance on digital technologies for contact tracing, vaccine rollout, and other public health responses points us to the possibilities of further investment in digital public infrastructure.

We must unpack the motivation of seeking profit through surveillance technologies and of maintaining a status quo where some people and communities are perceived as a threatening "other".

While recognizing the power of public oversight of and public investment in technology, many of the harms outlined here preexist the introduction of technology and are at times meted out by governments themselves. Companies and governments investing in the production, improvement, and dissemination of surveillance technologies are taking

advantage of existing breakages in our society: breakages on who is fully seen as human and deserving of privacy or the ability to consent. The paths forward can include regulation and oversight on technology, like strict limits to data sharing between public health departments and police when digitally contact tracing during COVID-19 and future pandemics. Or the path forward can focus on unraveling the roots of the systems that make turning to surveillance technology in our workplaces, public places, and digital spaces desirable and profitable. Opportunities to invest in community and collective well-being are displaced when we invest in surveillance technology in service of maintaining structures that "other."

Our goal should be to construct a world where community care comes first.

Racial disparities are apparent in the use of surveillance data to pursue those accused of crimes and in the practice of monitoring and censoring community activism on social media. These disparities exist because of existing narratives around who is a threat and whose privacy is important. In contrast, certain values—privacy, consent, accountability, contestability—are afforded to those who are not seen as threats. In the health-care setting, there is an industry debate on the ethical use of data sharing and "what to tell the patient" about the emerging prevalence of medical AI based on active surveillance.[167] In workplaces like Amazon, which is bifurcated between high-wage corporate work and low-wage warehouse work, surveillance technologies are being deployed against warehouse workers with little industry debate. Amazon workers experience "nearly double the national average rate of warehouse workplace injury and chronic stress from the workload and work quota system" administered by surveillance technology.[168] As awareness of these disparities grows, it is important not to focus our efforts on a more equitable distribution of surveillance, but rather a world with universal goals of centering care for all.

PART
04

COVID-19, Social Media Manipulation, and Our Changing Information Ecosystem

Social media has become a primary influence on popular culture and politics, driving a paradigm shift within the traditional media industry and modes of public discourse globally—redefining the proverbial public square. Facebook and YouTube are the most popular social media sites, with approximately 70 percent of US adults surveyed by the Pew Research Center having a presence on social media and over 50 percent using Facebook several times a day.[169] World leaders have recognized that apps like Twitter provide an influential platform for direct, constant communication with citizens, with nearly one thousand officials at the highest levels of government across the world among Twitter's user base.[170]

The collective nature baked into social media creates new opportunities to connect across geographical space, widely disseminate important information, democratize content creation, and amplify underrepresented voices. But digital spaces can also be usurped by individuals and institutions that engage in harassment, misinformation and disinformation campaigns, and surveillance—with powerful consequences beyond the digital realm. These threats have been realized as the COVID-19 pandemic has unfolded, prompting debate over the responsibility that social media companies have in moderating false and harmful content. This debate is not new, as the spread of false and harmful content on social media has been the conduit for violence against marginalized groups across the globe with little resolve from tech companies or their intended regulators.[171]

The COVID-19 pandemic has increased people's reliance on technology for health information on the novel virus and to maintain social connections during stay-at-home orders. This increased dependency on technology is associated with physical and mental health risks. During the first weeks of quarantine, iPhone users expressed anxiety and playful competition over the phone's screen time reports that showed spikes in the amount of screen time. Some reported an increase of as much as 180 percent of screen time in the first week of quarantine.[172] This increased time on devices also meant the nation and the world were more reliant on social media for "collective sense-making"[173] of other historical moments unrelated to COVID-19, such as the police killing of George Floyd in Minneapolis and the uniquely strained 2020 US presidential election. While the public health crisis of police killings

of Black people and the phenomenon of images of recorded killings going viral is not new, the nuances of social media virality during global stay-at-home orders has been considered a contributor to the uprisings and ongoing #DefundThePolice and abolition movements following Floyd's murder. The convergence of COVID-19, the 2020 US presidential election, and the historic 2020 protest movement highlighted the challenges of collectively processing information online.

Social media has played a central role in circulating unprecedented amounts of false information about the pandemic, from its causes and who is to blame, to how members of the public should respond to prevent the virus's spread. False information is often described in two ways: misinformation and disinformation, which are distinguished by intent. Misinformation refers to information that is unintentionally inaccurate. In the case of COVID-19, incidences of misinformation tend to reflect the fact that little is known about the topic. This increases the possibility of unintentionally misconstruing data or sharing information that, as research progresses, is later found to be incorrect. In contrast, disinformation suggests willful deception or misrepresentation of data. Both forms of false information prominently shaped public opinions and actions throughout 2020, and their uncontrolled spread—largely via social media—has been described by the World Health Organization and other health officials as an "infodemic."[174] This section explores how information—false, true, and somewhere in between— has spread during the COVID-19 pandemic, how the original design and motivations for social media's engineering are at play, and how the impacts are felt in different communities.

CASE STUDY

Misinformation and Disinformation during the COVID-19 Pandemic

As social interactions have increased on virtual spaces like Facebook, Instagram, and Twitter during the pandemic, false information on these platforms has spread at an astounding scale and speed. An April 2020 study by the Reuters Institute for the Study of Journalism reports that one out of three individuals across six countries had been exposed to misleading information about COVID-19.[175] Recent research estimates that bots are responsible for half of all Twitter accounts spreading false information about COVID-19.[176] The Global Investigative Journalism Network defines bots as algorithms posting content rather than a human being, and notes that the three key bot indicators are "anonymity, high levels of activity, and amplification of particular users, topics or hashtags."[177]

A systematic literature review on the spread of health-related misinformation on social media found that, even prior to the COVID-19 pandemic, misinformation regarding other infectious diseases (such as those caused by the Ebola and Zika viruses) and associated vaccine treatments is most

prevalent by far, compared to other topics such as cancer or diet and nutrition.[178] This study suggests that there is something about infectious diseases, especially novel viruses that scientific knowledge has not yet caught up to, that makes them overwhelmingly subject to misinformation.

Research on the spread of online misinformation shows that the perceived lack of a scientific consensus about a health issue is fertile ground for the amplification of health misinformation.[179] Experts note that when scientific information reaches the public, but seems uncertain (as is often the case with novel viruses that scientists are researching) or is met with contradiction as knowledge and information builds, the public loses faith in the health institutions and turns to alternative explanations. This opens the door for conspiracy theorists to come up with alternative explanations of the origins of the virus and even push their miracle cures that they sell online.[180] The social media landscape has fostered what Renée DiResta of the Stanford Internet Observatory describes as a "conspiratorial ecosystem," where public distrust of state and public health institutions is cultivated.[181] Researchers point to the antivaccine, or "antivaxxer," movement as a predecessor of the false information and conspiracy theories spreading about COVID-19, its treatments, and its origin. Dr. K. "Vish" Viswanath of the Harvard T. H. Chan School of Public Health goes further to suggest the antivaxxers and COVID-19 conspiracists may be working together.[182] The spread of the antivaccine movement demonstrates how information regarding negative experiences with health-care treatment is more likely than positive experiences to spread online,[183] and rumors become more popular than evidence-based information.[184]

The following are examples of COVID-19 conspiracy theories and false information regarding the virus that were widely disseminated on social media platforms over the course of 2020. It is often difficult to determine the difference between a conspiracy theory or rumor that emerges organically—lending itself to the definition of misinformation—and an intentional disinformation campaign.[185] The power of a trusted or well-amplified voice is a consistent through line in examples of false information being widely disseminated.

Online Conspiracy Theories Creating Physical Risks
The conspiracy theory linking 5G cell phone towers to COVID-19 was one of the most dominant misinformative discourses early in the pandemic. *Wired* magazine traces the conspiracy theory origins to a January 2020 article in the Belgian newspaper *Het Laatste Nieuws*.[186] The article called attention to unsubstantiated assertions made by a physician, Kris Van Kerckhoven, that the COVID-19 virus may be associated with the 5G towers that were built in Wuhan, China, where the virus originated. This theory built on existing claims that have circulated for years regarding adverse health effects tied to telecommunications technology, such as mobile phones and high-voltage power lines.[187] By March 2020, the ten most viewed 5G conspiracy theory videos linking COVID-19 to the technology had been viewed 5.8 million times.[188] In April 2020, social media posts by celebrities

such as John Cusack and Woody Harrelson further amplified the theory, reaching at least 487 Facebook communities across 30 countries and 84 Instagram accounts with an audience of nearly 60,000 followers.[189]

The unsubstantiated link between COVID-19 and 5G and other conspiracy theories has been associated with material violence and impacts on infrastructure and public safety. In the United Kingdom, it is suspected that large Facebook groups like "Stop 5G U.K.," with more than 58,000 members, encouraged actions that led to arson and destruction of dozens of cell phone towers.[190] Believers have harassed and threatened the safety of groups believed to be behind the conspiracy, including health professionals, vaccine advocates, and telecommunications technicians.[191] Following the spread of conspiracy theories related to vaccines by celebrities and social media influencers, death threats were sent to high profile authorities and advocates for a COVID-19 vaccine, including Dr. Anthony Fauci and Bill Gates.[192]

Medical Misinformation as a Danger to Public Health and Safety

Unsubstantiated claims about medical treatments can have deadly effects on the people who use them. When then president Donald Trump touted the antimalarial drug hydroxychloroquine as a preventative treatment or "miracle" cure for COVID-19,[193] at least one individual died from consuming a nonprescribed version of the drug. The president only cited anecdotal evidence of the off-market application of the drug, while the US Food and Drug Administration (FDA) issued a conflicting statement that cautioned the public against its use outside of hospital care and clinical trials due to the potential of serious side effects.[194] Despite the FDA's announcement, the president's words and authority influenced many people wanting to protect themselves as well as many others seeking to profit from the situation.

Following then president Trump's statements, pharmacists reported that the increase in demand for the drug risked supplies for people who depend on it as a treatment for chronic conditions.[195] HealthWarehouse, an online pharmacy that fills prescriptions of hydroxychloroquine, reported that the monthly demand for the drug increased by 5,000 percent.[196] Ross Goetz, business manager for the company, remarked in an NPR interview that many of the physicians signing the requests had been out of practice for years and were not doctors of internal medicine, but dentists, podiatrists, and veterinarians.[197]

Disparate Impacts of Media Manipulation on Communities of Color

False Health Information Targeted at Communities of Color

Due to targeted, race-based messaging, specific historically marginalized demographic groups may be more exposed to or impacted by false information during the pandemic. This includes African Americans, who have had one of the highest COVID-19 fatality rates among racial groups in the United States.[198] In mid-2020, a widely circulated Facebook post with

the headline "People of Color May Be Immune to Coronavirus Because of Melanin" spread the false belief that African Americans are immune to COVID-19.[199] Jahmil Lacey, a health disparities researcher, explains that this may have contributed to the disproportionate impact of the virus on African American communities.[200] As Lacey points out, this case demonstrates how social media can perniciously deepen the distrust that many African Americans already have of medical professionals, which is rooted in historic cases of systematic abuse of African Americans, like the Tuskegee Experiment.[201] Aside from conspiracy theories, factual reports of contemporary acts by government officials—such as then vice president Mike Pence's announcement of a plan to test an experimental drug to treat COVID-19 on 3,000 residents in the majority African American city of Detroit—further break trust in government and medical institutions.[202] Together, these stories drive the "othering" of communities who already face layers of discrimination within the health-care system, all while they are most deeply impacted by the pandemic.

False Narratives Driving Xenophobia and Racial Violence

Misinformation regarding COVID-19's origins in China has fueled anti-Asian sentiment on local and global scales. Early origin stories linked the disease to the consumption of raw bats purchased in the Wuhan, China, market. Videos of Asian people consuming bat soup dishes and photos of bats packaged in cling wrap on display in a marketplace circulated online. The videos of restaurant customers eating bat soup have been debunked as not originating in China,[203] and the video footage of bats sold in what appears to be the Wuhan market have also been exposed as footage from an entirely different country.[204] These viral images linked Asian Americans with historic racist tropes that associate Asian people with dangerous, unsanitary, and unsafe eating practices. The rise of these xenophobic notions came with a wave of anti-Asian harassment and violence, including vandalism of Asian American businesses and physical attacks in which people report being spat on, told to "go back to China," or blamed for bringing the virus to the United States.[205]

The Anti-Defamation League documented over 90 cases of anti-Asian harassment from January to June 2020.[206] More recently in 2021, the national coalition group Stop AAPI Hate released a report describing the nearly 3,800 hate incidents reported against Asian Americans and Pacific Islanders, with online harassment making up nearly 7 percent of the reports.[207] This behavior has been fueled by politicians' use of terms like the "Chinese virus" or "Wuhan virus" for COVID-19, which strips it of its scientific name and attaches it to a geographical, national identity. Empirical research shows that this "othering" behavior by elite conservative politicians "activated" preexisting anti-Asian sentiment and xenophobia.[208] Besides then president Trump repeatedly referring to COVID-19 as "the Wuhan virus," other high-level US government leaders, such as Arkansas Senator Tom Cotton, tweeted messages suggesting that the Chinese government developed the virus in a lab and was hiding the severity of COVID-19.[209] While promoting xenophobia, these narratives also functioned to shift blame for the United States' lack of preparedness onto China.

These politically motivated attacks are further strengthened by the power of technological tools such as bots. Bots are predominantly found on Twitter and other social networks that allow users to create multiple accounts. Twitter reportedly removed nearly 24,000 accounts of suspected bots from its platform for spreading false information about the Chinese government's response to the virus.[210] The suspected bot accounts were perceived to counter claims of the United States' mishandling of the pandemic, while some tweets claimed the virus originated in the United States.

In this way, bots can be seen as the strong winds propelling the digital wildfires started by bad actors, who find opportunities to play on existing prejudices and social conditions to shape narratives to their preference.

Networks like Twitter are designed for us to seamlessly share content within our own networks and reach people far outside of our networks—this ease of use is an intentional product design feature often described as a lack of "friction" in modern-day social media.[211] The frictionless nature of social media provides fertile ground for bots to spread information—especially sensationalized, false information—at a scale impossible for humans to achieve. Social media does not require information to be true, let alone verified, to be shared. Most networks allow for users to be anonymous and hold multiple accounts without verification that the account is managed by a human rather than an algorithm. Many tech companies managing social media networks inconsistently hold public figures—who the public may regard as credible sources—accountable for the misinformation they post. The long-awaited banning of President Trump from Twitter for election misinformation in early 2021 is an example of this. These conditions of social media predating the COVID-19 pandemic converge with the hateful motivations of political actors and the advancements in automated technologies in the form of bots. In this way, bots can be seen as the strong winds propelling the digital wildfires started by bad actors, who find opportunities to play on existing prejudices and social conditions to shape narratives to their preference.

Mental Health Impacts of Viral Black Death

The ubiquity of portable camera phones and ease of livestreaming or uploading footage on social media have contributed to instances of anti-Black violence in the United States going viral on social media platforms across the world. This has increased public awareness of the systematically unequal treatment of Black individuals by law enforcement while also creating disproportionate negative health consequences for Black viewers.

Police violence continues to be one of the leading causes of death for Black Americans. Roughly one out of one thousand Black men are at risk of dying

at the hands of the police—nearly three times more likely over the course of their lives compared to white men.[212] Given the disproportionate risk of death at the hands of government authorities that Black Americans face, there have been studies asserting police violence as a public health threat. However, not much attention has been given to the mental health impacts of being exposed to viral images of Black death where the victim's final moments are captured on video and posted on social media platforms for the public to view and share. The 2018 *Lancet* study on self-reported mental health of subjects who had heard of a police killing of a Black person revealed that, while both Black and white Americans report poor mental health days after hearing such news, Black research participants reported 0.14 additional poor mental health days for each police killing of Black men they had heard of. This research implies that Black Americans are not only disproportionately at risk of police violence, but also bear the psychological burden of the poor mental health that comes along with knowing about the loss of life due to excessive force by police.

Social media magnifies the extent to which individuals are exposed to viral images of Black individuals dying at the hands of law enforcement. In the wake of the deaths of Philando Castile and Terence Crutcher, a 2016 PBS interview with Monnica Williams, director of the Center for Mental Health Disparities at the University of Louisville, stated that vicarious trauma induced by graphic videos combined with the lived experience of racism can result in symptoms of post-traumatic stress disorder.[213] According to Williams, the social media timelines of Black users expressing mental anguish, grief, and pleas for peers not to share the viral videos in the weeks of Alton Sterling's and Philando Castile's killings were not unusual as exposure could result in serious psychological issues: "It's upsetting and stressful for people of color to see these events unfolding...It can lead to depression, substance abuse and, in some cases, psychosis. Very often, it can contribute to health problems that are already common among African-Americans such as high blood pressure."[214]

The ability to view footage of anti-Black violence at the hands of police on social media platforms raises an important ethical question. Some may argue that social media has been a critical tool in generating mainstream attention and elevating long-standing calls for justice. Those who argue that the images are not appropriate to share on social media, like activist and media strategist April Reign, assert that the playing and replaying of footage of the deaths of victims of police brutality is a form of digital voyeurism, which has historical roots in the public lynchings of Black individuals:

> "It is a dehumanization of black people, and we don't see that with any other race. It's ingrained in us from our history...White people used to have picnics at hangings and at lynchings, bringing their children to watch black bodies suffer and die. We are not far removed from that, it's just being played out through technology now. And it hurts."[215]

Reign has used social media to point out that media outlets considered it inappropriate to air televised footage of white news reporters who were shot and killed in Virginia out of respect for the victims and their families.[216] The double standard in how violent deaths are broadcast does suggest that the lives of Black victims of police violence are not held in the same sacred regard or connected to mourning family members as white victims. The message of selective censorship is one of dehumanization of Black individuals.

Some social media platforms like Facebook and Instagram have recognized the triggering nature of viral deaths and have placed filters over the content that give a warning of graphic material. These filters blur out the content and require an additional click to view so unsuspecting social media users will not be triggered by witnessing a person's violent death. Dr. Danielle Kilgo, assistant professor of journalism, suggests another course of action to avoid reposting of violent anti-Black deaths while not sacrificing raising awareness and encouraging important discussions of police brutality: "By posting things other than just his death, [you can share] histories of how this happened, or advocacy agendas, or other kinds of grievances that relate to this...we can drown out these videos a little bit if we can give people other things to look at."[217] This action grounds the root causes of police brutality, protects the humanity of the victims, and sets forth actions social media users can take to support advancing policy agendas to combat this violence.

Key Factors Driving Media Manipulation

A through line in these stories of how information flows through our social media channels is the virality of the content. Viral content means more engagement of users on the platform, which is profitable for social media companies. Ruha Benjamin explains how the profitability of anti-Blackness is enabled by design of social platforms: "Twitter's relatively hands-off approach when it comes to the often and hate-filled content of White supremacists actually benefits the company's bottom line. This is a business model in which more traffic equals more profit, even if that traffic involves violently crashing into other users..."[218] The violence of users crashing into one another is experienced more than metaphorically, as discussed in the case of the mental health impacts of viral images of Black death. Other forms of violence also morph to the tools of digital space. During the pandemic, online gender-based violence has been on the rise, and the "permanence and virality of abusive content" has been cited as a source of revictimization and traumatization of those targeted—most frequently, young women, queer-identifying individuals, and people of color.[219]

The disparate impacts we discuss on communities at the margins can be tied back, as Benjamin states, to the driving factors of social media itself. Here we explore the psychological engineering of social media, the profit motivations of social media companies and content creators, and the complexities of an information ecosystem increasingly reliant on digital spaces.

Social Media's Psychological Engineering

Social media platforms are free for users; however, it is often forgotten that these free platforms are extensions of large money-making companies. The users are the product, and income is generated from their clicks on paid advertisements and personal data generated from online engagement. It is in the best interest of companies to have social media users spend more time on the sites consuming content and clicking on advertisements. A strategy employed is to provide frictionless sharing and reposting of content where anyone can create and share information without credentials, then users can see which of their friends "liked" or commented on the post to draw that user to look at what their friend is engaging with and reshare it to a larger friend network. Psychological behavior is a large part of user experience and user design research. CareerFoundry describes the background necessary to become a user experience researcher (UX) as "[it] typically requires knowledge or experience in a relevant field that studies human behavior, such as cognitive science, behavioral economics, anthropology, sociology, or psychology. Ultimately, it's important to be adept at reading people and empathizing with the user."[220] Such requirements are seen in a recent Instagram job posting for a UX qualitative researcher that requires a bachelor's degree in a "human behavior" related field but prefers applicants holding an MS or PhD in human-computer interactions, psychology, social science, or information science.[221] Psychology experts suggest that people tend to view what their friends say and share as more credible than that of a stranger or an institution.[222] This results in information silos and confirmation bias where the algorithm shows you content of people who think most like you, making it less likely that you will see and engage with contradictory information or dissenting opinions. This is strategic engineering to encourage more engagement. However, this is problematic to dissemination of critical information because when people weigh if something read is true, they ask themselves if it is compatible with what they already believe, if others believe it, and if the source is from someone they know.[223]

Advertising and Click Monetization in the Attention Economy

Safiya Umoja Noble's 2018 *Algorithms of Oppression* argues that websites pose as libraries of information but are actually structured marketing platforms of advertisements that bias information a consumer may receive.[224] In other words, they are platforms for "click monetization," or the generation of capital through users clicking on and consuming online content. The money generated from increased traffic is not only beneficial to the platforms, but content creators as well. Despite the financial benefits gained by social media companies and influential users, platforms designed for click monetization open users to a host of negative mental health impacts, including social media and internet addiction, and a decrease in self-reported mental well-being due to negative self-comparisons with peers based on social media posts.[225] Along with decreased mental health, physical health is also endangered when users use attention-getting conspiracy theory content to gain followers and drive traffic to sell merchandise or other products. Within the business model of

click monetization, race, racism, and hate speech become profitable and entangled with users' consumption of news, while the corporations behind the platforms have no incentive to intervene in racist interactions or the dissemination of misinformation.[226]

YouTube influencers wanting to draw a larger audience know they can capitalize on conspiracy theories to garner views, resulting in income even when said conspiracy is unrelated to the theme of their channel. Patrick Bet-David's YouTube channel, *Valuetainment,* which is dedicated to financial education and has a following of over two million subscribers, has hosted interviews with antivaccine proponents such as Alex Jones, who was banned from both YouTube and Facebook for spreading medical misinformation, and Robert Kennedy Jr., who also claims he was flagged and censored on his social media accounts for his antivaccine content.[227] The interview titled "Robert Kennedy Jr. Destroys Big Pharma, Fauci & Pro-vaccine Movement" garnered 500,0000 views in a matter of two days. The advertisements that ran prior to and during the video featured Bet-David's merchandise. Researchers have found that this sort of tactic—using conspiratorial content to drive traffic to a content creator's site where they sell merchandise—commonly drives the spread of conspiracy theories online.[228] The merchandise involved often includes products marketed as miracle cures that are accompanied by unsubstantiated claims of their effectiveness in treating infectious disease.

King's College London researchers analyzed the profiles and home pages of 102 YouTube conspiracy influencers and found trends in their use of specific monetization strategies: 56 percent offer goods or services for sale, while 41 percent offer memberships and subscriptions using direct payments through PayPal, crowdfunding sites like Patreon, or cryptocurrencies like Bitcoin.[229] In tandem, platforms like YouTube generate income from advertisers seeking to reach the fans of conspiracy influencers and from the money that conspiracy influencers spend on ads to reach a wider audience. Researchers tracing the business model of David Icke, one UK-based conspiracy influencer with over two million followers, estimate that Icke's content could be worth up to $23.8 million in annual revenue for tech giants.[230] This mutually beneficial system helps to explain why misinformation and disinformation spreads with limited intervention from tech giants like YouTube.

Complex and Networked Nature of Today's Information Infrastructure

Getting to the roots of what drives misinformation and disinformation is complicated given the complexities in how information flows through the web. The Technology and Social Change Project (TaSC) at Harvard University is one group illuminating what conditions in our information infrastructure allow for false information to spread on the internet and, when deliberate, the strategies and tactics used to manipulate these conditions. Joan Donovan, director of TaSC, notes that "information is extremely cheap to produce. That's why misinformation is a problem, because you don't need any evidence, you don't need any investigation, you don't need any methods

to produce it. Knowledge is incredibly expensive to produce. Experts are sought after, and they aren't going to work for free."[231]

This frame of our information ecosystem ties back to the roots of how social media platforms were engineered. Content moderation to filter this barrage of free information adds steps to the process of posting or accessing content. More steps translate to more "friction" in the user experience. This original design of the internet—frictionless and content agnostic—has been accompanied by other shifts in the United States' media landscape that create the conditions for misinformation and disinformation, or more broadly speaking, media manipulation: the decline of professional journalism, the expansion of financial resources devoted to political influence, and the growing sophistication of targeted advertising with little oversight.[232] Our tools to spread false information are growing stronger (money in politics and targeted advertising), while our tools to create and share quality information are growing weaker (local, professional journalism).

Interestingly, there is evidence to suggest that the public will adopt corrective health information online when presented to them. In their study of health misinformation on social media, Emily K. Vraga and Leticia Bode found that even individuals with high conspiratorial ideation were able to accept the correct health information when presented to them, especially when correction comes from a close tie.[233] But the mechanisms for getting the correct information to general audiences are complicated and, as Donovan notes, do not come cheap. Vraga and Bode suggest that some quick interventions are possible, such as the brand Tito's publicly debunking the myth around their vodka as a substitution for hand sanitizer. However, they recommend that platforms engage experts to test interventions for correcting misinformation and to investigate the "frequency, scope, and type of misinformation and correction occurring on social media." There has been traction made on some fronts, such as Facebook, Instagram, and Twitter investing in content moderation more than ever before by tagging misinformation in real-time and booting off repeat offenders.[234]

While these interventions have been much awaited, *Infodemic* researchers Liliana Bounegru, Jonathan Gray, and Tommaso Venturini note that "there is also a case for slowing down and dwelling with the infrastructural trouble."[235] In a similar vein, Vraga and Bode note that there is much work remaining to "investigate how to develop appropriate social norms or interventions to encourage corrections [of health misinformation] on social media [and ensure] corrections come from across the population, representing different demographics, backgrounds, and attributes."[236] New policies for content moderation can reasonably be met with questions as to who will do the moderating and what values will be centered. Virality on social media is a challenging beast to conquer, from superspreading health misinformation to viral images of graphic violence against Black people. Returning to the "infrastructural trouble," the design of social media itself— the business model and the priority given to a "frictionless" experience and optimizing for engagement—is emerging as a path to more broadly address the promises and threats that social media has exposed in the COVID-19 era.

Implications

Online health misinformation has real-world consequences.

While this analysis is grounded in the spread of false information regarding health, the roots are much deeper. The macrocontext concerns a slow erosion of trust in government, in health and scientific institutions, and in each other.[237] Research shows that a belief in one health conspiracy leads to a larger rejection in science.[238] Data & Society researcher Erin McAweeney reminds us that this creation of fundamentally different realities—done both deliberately and inadvertently—paves the way "for an oppressive power to take advantage of a fragmented society much more vulnerable to misinformation in the future."[239] Overlapping conspiracy theories—QAnon, COVID-19 denial, election denial—in digital spaces[240] have dangerous climaxes in the real world, like the 2021 insurrection at the US Capitol. This terrifying trend is easier to confront when we acknowledge the shared roots in systems that stratify by race and identity. Community organizers from California to Michigan to Georgia are confronting how white supremacy infects the COVID-19 response and corrupts democracy.[241]

Deliberate disinformation is fast evolving and takes concerted effort to trace.

Content moderation and government policy has not kept up with the evolving tools of disinformation, such as bots, digital blackface,[242] and deepfakes.[243] The media manipulation field guide created by Harvard's TaSC is a move toward improving our understanding of the forces at play when content intentionally spreads false narratives.[244] With a new presidential administration, there are new possibilities to change the conditions that help a false sense of reality take hold and spread like wildfire.[245]

Our social media infrastructure started one way, but it doesn't have to stay.

As discussed, media manipulation's disparate impact on communities of color is tied to the way social media is structured itself: frictionless, optimized for engagement, financially fueled by tech giants and content creators who learn the path to amplification. Content and content moderation that is in-language and culturally sensitive is a step forward, but not all communications can be screened and regulated. Communities outside of the dominant structures—diasporic communities, queer communities, low-income communities—have always found ways to communicate outside of traditional channels and adapt to the tools available, from community defense on public social media forums to private WhatsApp and Viber groups. There is an opportunity to build on this community-led creation and confront the concentration of power in the creation and funding of social media. The future of social media, which drives much of our information ecosystem, will be defined by our ability to regulate the current structures, but also create new structures that embody the values of a broader community.

Opportunities and Paths Forward

How can society ensure that emerging technologies contribute to creating a world where all belong? As the tech sector reckons with the relationship between technology and inequity, much of the corporate efforts to answer this question have focused on rectifying existing problems with technological design—an initial step to "do no harm" or create ethical technology. But beyond ethics, the broader field of stakeholders concerned with tech equity is calling for a more expansive approach, one that addresses inequities embedded within the social and political systems that have produced the outsized influence that private tech corporations and their products now hold. Within this paradigm, movements have coalesced around necessary reforms as well as abolitionist approaches to technology, both which call for governance, policy, cultural, technical, and operational changes. Furthermore, advocates of change envision a range of roles for and uses of technology to advance not just equity, but also justice, liberation, and belonging. While not exhaustive, this section provides an overview of some of the key solutions, interventions, systems changes, and opportunities for action that various stakeholders have envisioned in response to technology-driven inequality.

Guiding Questions and Frameworks

The Role of Technology in Social Change
As the tech field confronts the disparate negative impacts produced by technology, the key question is: what role should technology have in social change? In response to this question, Abebe et al. offer an analytical framework for understanding the valuable roles for computational work in social change that not only include but also go beyond correcting harms that technology itself perpetuates. For example, computing is essential to "auditing" technical processes to detect and name bias within data and "black box" algorithms, which can increase transparency and accountability. In a different vein, it can also expose the limits of technological interventions—what Abebe et al. call computing as "rebuttal"—in order to refocus on the need for broader, non technological systems change. This is particularly important when public investment in technological solutions may result in the diversion of resources from other less-tech-intensive initiatives aimed at advancing equity.[246] Key to this framework is the rejection of the pervasive "solutionist" notion that technology can solve intractable social problems on its own, instead defining discrete roles for technology situated within a longer horizon of

social change processes and in relationship to a broader ecosystem of social intervention.[247] Similarly, Data & Society researchers Madeleine Clare Elish and Elizabeth Anne Watkins argue for the need for approaching the use of AI through a "sociotechnical lens: one that acknowledges the human labor required to harmonize a technical system with existing organizational and social structures"—as an ongoing process of *integration* rather than a single point of deployment—that includes repairing the "breakages" in social structures that result from AI, especially when technological systems do not work as intended.[248]

Technology and Abolition

As we have reviewed throughout this report, technology is socially determined, and its creation and uses cannot be separated from the conditions of society. For many operating at the intersection of justice and technology, abolition is a grounding idea for countering techno-solutionism, which limits our imagination to only technical solutions. Scholar activist Ruth Wilson Gilmore states that "[a]bolition is abolishing the conditions under which prisons became the solution to problems, not abolishing the buildings we call prisons."[249] Sociologist Ruha Benjamin emphasizes the radical potential of democratized, abolitionist technology—technological tools imagined and created by individuals who are historically marginalized by technology, which explicitly serve to advance racial and social justice. She describes these as "abolitionist tools," or "technology with an emancipatory ethos, a tool of solidarity that directs resources to getting people literally free."[250] This must start with cultivating "counter-imaginaries," an act that is essential to resisting and breaking free from the digital world that has been imagined and crafted for the public by corporate giants.[251] In contrast to carceral technologies,[252] abolitionist technologies implore us to imagine uses for technology that move us away from our status quo. The framework of abolitionist technology guides our understanding of the possibilities ahead—not as a call to end the use of all technology, but rather a call to rethink our processes of funding, creating, and deploying technology in general, particularly for public interest.

A Range of Interventions: Ethical to Emancipatory

This section will explore a range of interventions, moving from those that tinker with the status quo to those that push us to reimagine the conditions that brought us to our current relationship with technology.

Exploring the range of interventions

1. **Industry Practices**
   a. Industry codes of ethics
   b. Accountability controls for machine learning training data
   c. Challenging the pathways to the tech industry

      d.   Addressing the power and access dynamics in the venture capital industry

      e.   Whistleblower and other workplace protections for tech industry workers

2. **Government and Policy**
      a.   State and local privacy regulation
      b.   Federal regulation of tech companies
      c.   Digital infrastructure as a public good

3. **Public and Cultural Interventions**
      a.   Grassroots tech development and governance
      b.   Speculative technology to educate and organize against the status quo
      c.   User-led corrections of misinformation and media literacy
      d.   Healing and solidarity through digital spaces
      e.   Decentering of computational expertise and building a broader coalition

Interventions Being Proposed and Tested

Reforming Industry Practices

As public support and advocacy for greater regulation of technology companies has increased, more tech sector leaders have accepted the notion that the government has a legitimate role in this area. Many of the industry's largest companies have thus sought to work with government institutions in shaping regulations while also working to define solutions that can be advanced through internal changes to industry practices instead of regulation. Regarding the latter, the discourse within the tech industry has focused more on ethics and fairness, rather than equity or justice.[253]

Industry codes of ethics. Many within the industry have expressed support for sector-wide ethics standards, particularly for emerging AI technologies. Various formations have proposed codes of ethics or other statements of principles to this end, such as the Asilomar AI Principles developed by the Future of Life Institute, which has been signed by over 1,600 AI and robotics researchers across the world.[254] Industry leaders have also formed cross-sector collaborations to develop best practices and advance solutions for AI ethics. The Partnership on AI (PAI) is among the most prominent. PAI was formed in September 2016 by a group of Big Tech companies like Apple, Amazon, Facebook, Google, IBM, and Microsoft but has since grown to include more than one hundred member organizations, over half of which are now nonprofit, civic, or human-rights-focused groups. This range of perspectives and positionality has inevitably created some friction between industry and civil society. Most recently, the nonprofit group Access Now resigned from the PAI stating that "[they] did not find that PAI influenced

or changed the attitude of member companies or encouraged them to respond to or consult with civil society on a systematic basis."[255]

Leading research institutes in the field of tech equity, including Data & Society and the AI Now Institute, have critiqued internally focused initiatives to reform the industry's products and practices, asserting that they alone are simply not enough. Data & Society researchers describe these efforts as an "institutionalization of ethics" that falls short of transforming the systemic roots of technology-driven inequity.[256] They argue that attempts to operationalize ethics are implemented according to the same industry logics that perpetuate inequity in the first place. This often leads to piecemeal technical interventions, such as ethics checklists, ethical project management frameworks, or coding packages that evaluate algorithmic bias. Such a limited perspective of "doing ethics" implies that the work is complete once these steps are taken. However, the illusion of completion is more of a performance, not an enactment of structural changes that shift everyday practices on which "ethical fault lines'' exist.[257] Structural changes could include shifting organizational practices, such as the tech industry culture of rewarding metric-oriented and fast-paced work with greater resources, or building new practices, such as publicly announcing cases where a tech company chooses not to release a product or feature that might cause social harm. A more complex, yet transformational, path forward would be a tech industry completely designed around ethics and social responsibility, rather than piecemeal checklists and technical solutions that "locate the source of the problem in individuals or technical systems."[258]

Accountability controls for machine learning training data. One recent development in attempting to create more equitable AI is a "dataset nutrition label." The Data Nutrition Project is dedicated to assessing the fitness and fairness of datasets that are used to train AI. Ruha Benjamin describes the dataset nutrition label as similar to the labeling on organic products; the label would break down the dataset's performance on certain measures of bias and signal the algorithm has gone through a standard of equity.[259] This is critical because as this landscape scan has shown, biased datasets are used to train important decision-making technology used in fields ranging from medical care to criminal justice decisions. The team at the Data Nutrition Project states: "There's a missing step in the AI development pipeline: assessing datasets based on standard quality measures that are both qualitative and quantitative…Similar to a nutrition label on food, our Dataset Nutrition Label aims to highlight the key ingredients in a dataset such as metadata and populations, as well as unique or anomalous features regarding distributions, missing data, and comparisons to other 'ground truth' datasets."[260] A dataset nutrition label may meet the need to integrate transparency and standardization in the field, but as discussed, addressing bias in algorithmic tools is not relegated to the data inputs[261] but rather requires evaluating the entire system in which the tool operates.

Challenging the pathways to the tech industry. The tech industry workforce is known to be a majority white male workforce, particularly the technical workforce of coders, engineers, UX designers, and data scientists who drive product development[262] One idea is to expand access to the computational expertise needed to work in the tech industry. Massive open online courses (MOOCs), tech bootcamps like General Assembly, the Google Career Certificate program, and a plethora of university extension programs offer any consumer with an internet connection the opportunity to earn a certificate in software engineering, machine learning, data science, or UX. In theory, this ease of access via online study benefits those facing barriers to traditional university education, like family caretaking obligations and the financial infeasibility of taking four years out of the job market. These barriers are disproportionately encountered by women and underrepresented minorities. As an example, Flatiron School offers coding bootcamps where 33 percent of the program's graduates are women, compared to university Computer and Information Sciences programs where 21 percent of the graduates are women[263]

But the evidence is mixed on whether expanded access and lower cost barriers to education actually unlocks access to high-paying jobs in the tech industry and, if so, to whom those benefits are distributed. Self-reported data from coding bootcamps boast that 73 percent of those surveyed had found full-time employment using their new skills and an average salary increase of $26,000.[264] But notably, 60 percent of those surveyed already had bachelor's degrees, indicating that such certification is not a replacement for university programs as bootcamps advertise. In fact, there is some empirical evidence that bootcamp certificates may have less value in the tech job market because of employers' perception of this untraditional route to gaining computational expertise.[265] Some argue that this is because expanding access to computational expertise is not getting to the root of the problem. Harvard Business Review notes that the barriers to a more diverse tech workforce range from much more than access to education: the demographics of the cities and states where venture capital and tech industry headquarters are located and tech industry's disinterest in actively pursuing diverse talent.[266]

Following the closure of several high-profile coding bootcamps, sociologist Tressie McMillan Cottom, who studies the rise of "lower ed" programs such as MOOCs and coding bootcamps, explains that coding bootcamps are a "tax paid by suitably credentialed workers who do not have enough capital (economic, social, or cultural) to enter a high status field of work in which some job is undergoing an actual or projected short-term demand bubble."[267] Cottom warns that bootcamps are an unproven market solution to what is a social problem of statistical discrimination in an emerging job market. More unclear still is whether a more diverse tech workforce necessarily creates a more equitable process of technology production to address the harms discussed in this report.

Addressing the power and access dynamics in the venture capital industry. Recent attention has been given to the lack of diversity in the venture capital field, which launches many of the businesses that now influence our daily lives by providing private funding for early-stage start-up companies. Richard Kerby of Equal Ventures, a firm dedicated to "bridging the digital divide," finds that 58 percent of the people who work in venture capital are white men.[268] More importantly, 93 percent of venture capital dollars are managed by white men in leadership positions that allow them to determine which start-ups are invested in and to receive most of the earnings from those investments.[269] Charlton McIlwain, digital scholar and author of a book about the history of the Black internet called Black Software, emphasizes that inequitable access to capital has disrupted the work of Black technologists who, even after access to elite education, were shut out of the funding circles necessary to be successful in the tech world.[270]

There are venture capital firms dedicated to combating the racial inequalities in venture capital, such as Oakland, California, based Kapor Capital. Kapor Capital believes that start-up companies with founding teams of underrepresented individuals have a competitive advantage because their backgrounds inform the questions they ask that lead to profitable, tech-driven solutions. Across the landscape of capital investment and philanthropy, there is a growing imperative to invest in underrepresented entrepreneurs and in underrepresented managers of funds like Kapor Capital.[271] As with the popular mandate to diversify the tech industry workforce, the impact of diversifying venture capital on equitable development of technology will be unclear without an express focus on investing in creators and movements that center equity and justice in their work.[272]

Whistle-blower and other workplace protections for tech industry workers. In addition to the possibility of removing barriers to entering the tech industry, there is space to reshape the power dynamics once employees join it. As with most companies, tech companies are capable of harming their own employees, especially people of color and those in precarious work, like contract workers and gig workers. Since late 2020, Google has faced controversy over the dismissal of two members of its AI Ethics Committee, including Timnit Gebru, one of the few Black women in the committee. Gebru had recently coauthored a paper highlighting the disproportionate environmental and social impacts of Google AI technology on all but the wealthiest countries and communities. As these events unfolded, a number of other people of color in tech shared their own stories on social media of how they have been pushed out of influential spaces or dismissed when raising issues concerning how their respective companies handle racial diversity, racial harassment, and ethical issues surrounding civil violations.[273] For example, in 2017, three women filed a class-action lawsuit against Google for segregating female employees into lower-paying positions and paying women less than their male counterparts for doing essentially the same work (a claim Google denied).

The problem does not just lie with Google but is so deep in the technology

industry that nearly half of the women in tech fields leave the industry, double the attrition rate for men.[274] The turnover rate for women and minorities in tech costs businesses $16 billion every year.[275] While unfair treatment, such as being passed over for promotions and having others take and receive credit for their work, is one of the largest drivers of employees voluntarily leaving the industry,[276] the stories of those who are deliberately pushed out or fired are harder to track due to nondisclosure agreements (NDAs) and fear of retaliation.

One of the emerging paths for addressing this inequity, with space for industry and government action, is whistle-blower protection. Whistleblower protection can help protect employees who speak up on ethical issues in their workplace, as well as ethical issues that may have societal impacts beyond their workplace, while actively employed or after ending their employment. UC Berkeley Center for Law and Technology Codirector Sonia Katyal argues that improved whistle-blower protections, alongside other industry accountability measures, are critical as our society is currently dependent on the self-regulation of private industry.[277]

Employees with computational expertise and insider knowledge are uniquely qualified to understand and expose violations of civil and human rights embedded in opaque AI tools. Oftentimes, the employees who expose these violations are then subject to retaliation from their employer or from fellow employees. For example, former Pinterest public policy and social impact manager Ifeoma Ozoma led efforts to address health misinformation[278] and the spread of extremist content on the platform and faced internal retaliation in the form of doxing and harassment. In the process of seeking accountability for these events, Ozoma discovered the limitations of current whistle-blower protection legislation in California and worked with California State Senator Connie Leyva to introduce the "Silenced No More Act," which would close the loophole prohibiting employees from speaking out against discrimination in the workplace and ethical violations in the public interest if they have signed a company NDA.[279] Ozoma believes action is needed at the federal level to address the growing role of NDAs in the tech industry but is also working to push industry, particularly corporate boards, to fill the gap in accountability themselves. *VentureBeat's* senior AI staff writer Khari Johnson sums up the path ahead to reform whistle-blower regulation as a "clash between the rights of a business to not disclose information about an algorithm and the civil rights of an individual to live in a world free of discrimination."[280]

As seen in these examples, advances in industry practice often still require a public challenge before a company will openly address the bias or harm created by one of its products, or harms experienced by their own employees. In addition, some attempts to reform industry have exposed the limitations of voluntary self-regulation from powerful industry actors with little to lose but their profits. For example, the Algorithmic Justice League (AJL), a leading public interest technology advocacy organization, has ended its Safe Face Pledge, an attempt to guide industry on regulating themselves on the harms of facial recognition.[281] The Safe Face Pledge

found that "the requirement that lethal use be curtailed proved to be a stumbling block, given many firms' desire to support law enforcement and military applications." Tellingly, the AJL has instead launched a program focused on community-driven oversight of the creation of AI.[282] Understanding the linkages between the power of the tech industry and the power of the capital structures that fund the industry, French economist Cédric Durand encapsulates the multiple paths forward: "We need a centralized response so that we can meet capital and technology at the scale that it exists, alongside a reimagination of the resources we have at a local level to organize life differently."[283] This introduces the importance of leveraging the role of government to respond to tech industry power and to facilitate this reimagining of our resources at the local, community level.

Government Regulation and Legal Reforms

Public support for government regulation of technology with the purpose of protecting digital privacy has grown. In a 2020 survey conducted by the Pew Research Center, three-quarters of Americans said they believe there should be more government regulation of what companies can do with their customers' personal information.[284] Many within the field are also calling for greater public oversight of the deployment and testing of new technologies. Campaigns to regulate local public agencies' use of technology have gained traction, with the recognition that regulating public agencies is a strategic starting point for reform, given that a major source of private sector companies' revenues are often government contracts. For instance, Palantir, the data mining software company whose collaboration with local and federal law enforcement has been the strategic focus of organizers for migrant justice, pulled in roughly half of their 2019 revenue from work with the US federal government.[285] Tech giants like Amazon, Google, Microsoft and others have thousands of contracts with US military and law enforcement agencies.[286] Many of these contracts are too opaque to even understand what service the company is providing but make the important role of transparent regulation and reform abundantly clear.

State and local privacy regulation. In several cities, advocates have successfully advanced laws banning government use of certain surveillance technologies, which are often accompanied by the establishment of citizen commissions that have the authority to approve or deny local government agencies' use of any new technologies that may impact citizens' privacy and civil rights. For example, the City of Oakland's Privacy Advisory Commission was formed in 2015 and "provides advice to the City of Oakland on best practices to protect Oaklanders' privacy rights in connection with the City's purchase and use of surveillance equipment and other technology that collects or stores our data."[287] The City of San Francisco has taken a similar approach by establishing a facial recognition ban and an Office of Emerging Technology within the Department of Public Works.[288] While new technologies may be implemented if approved, such policies and governance structures change the balance of power by giving residents a say in the process, whereas in cities without

tech surveillance bans, government agencies have the authority to adopt any new technology by default, often without any transparency, public discourse, or oversight. Rashida Richardson, a visiting scholar at Rutgers University, explains that this amounts to experimentation of new technologies on live populations, which is otherwise highly regulated for other sectors, such as the pharmaceutical industry.[289] Other advocates have drawn similar comparisons, calling for a governmental body charged with regulation of new technology that functions like the FDA or Federal Aviation Administration.[290]

In addition to the aforementioned local advocacy efforts, statewide campaigns have formed around proposals introduced in the California State Legislature. These include the Automated Decision Systems Accountability Act of 2020 (AB 2269), as well as attempts to strengthen existing laws such as the California Consumer Privacy Act and the Confidentiality of Medical Information Act (AB 2261 and AB 2280, respectively).[291] While state and local policy change is currently understood to be more politically feasible, advocates' efforts are largely grounded in a broader goal of federal regulation of both the government and private sector's use of technology.

Federal regulation of tech companies. Proposals for federal policy change have also gained some traction. Multiple members of Congress have introduced legislation to regulate emerging technologies used for surveillance, law enforcement, and algorithmic decision-making systems. While none have yet been adopted into law, bills introduced in the 116th Congress include the Algorithmic Accountability Act,[292] Safeguarding Americans' Private Records Act,293 and the Facial Recognition and Biometric Technology Act.[294] Nicol Turner Lee, director of the Center for Technology Innovation at the Brookings Institution, has proposed another approach: modernizing the Civil Rights Act of 1964 to clarify that it applies to decisions made by AI.[295] While these proposals center around civil rights and privacy laws, the creation of an effective regulatory framework also implicates other areas of law, including trade secrecy and intellectual property, labor, antitrust, and even global trade. As of yet, it appears that attempts to address each of these legal areas are occurring on separate fronts, rather than through a comprehensive, unified approach.

The US House of Representatives' Antitrust Subcommittee released a report in October 2020 criticizing tech companies—Amazon, Apple, Facebook, and Google specifically—for "buying competitors, preferencing their own services, and holding outsized power over smaller businesses that use their platforms."[296] The 450-page report indicates that, in addition to putting forward legislative reforms, Congress must restructure American antitrust laws to "[reassert] the original intent and broad goals of the antitrust laws by clarifying that they are designed to protect not just consumers, but also workers, entrepreneurs, independent businesses, open markets, a fair economy, and democratic ideals."[297] The Biden administration's appointment of Lina Khan, an antitrust and competition legal scholar who

served as counsel to the Antitrust Subcommittee as a commissioner at the Federal Trade Commission, is an indicator of the possible direction the administration will take on regulating tech companies and advancing a more comprehensive framework for that regulation.

While the United States lacks a comprehensive federal framework for data privacy regulation, over 140 countries have national data protection laws that govern private and public sector use of data.[298] The European Union's General Data Protection Regulation (GDPR) is often upheld as a model framework for regulating the collection, retention, and disclosure of citizens' personal data, including instances where such data may be used for machine learning. The GDPR is described as the "toughest privacy and security law in the world," where penalties for violations include a maximum of 20 million euros and the right for consumers to sue for damages. The law applies to organizations and companies that may use data from a EU citizen regardless if the company is located in the EU.[299] Organizations such as Auditing Algorithms are advocating for consumer and civil rights protections similar to the GDPR.[300] Alongside the possibilities of individual tech worker whistle-blowing to regulate private industry, Katyal proposes the legal requirement of a "human impact statement in algorithmic decision-making" that can mirror many of the protections granted through the EU's GDPR.[301] Katyal does note that "impact assessments can become a mere procedural tool that may not be able to create the change they seek," and thus these impact assessments cannot stand alone or be considered a complete fix for complex problems with layers of self-interest from private companies.

In a similar vein, Benjamin points out that although consumer data protections are important, they fall short of protecting individuals from the disproportionate impacts of police and state surveillance since data used to prevent, detect, and investigate crime are exempted from the GDPR.[302] For this reason, many advocacy efforts go beyond consumer protections, focusing instead on human rights. For example, the Coded Bias Impact Campaign calls for a universal declaration of data rights as human rights.[303] Human rights experts also argue that technology-driven racial inequity is a matter of human rights and that states have an obligation to prevent and combat racial discrimination in the design and use of emerging digital technologies.[304]

Digital infrastructure as a public good. Our societal reliance on digital technologies for contact tracing, vaccine administration, distance learning, and other public needs calls attention to the role of government in the digital space. For example, access to COVID-19 vaccines in the United States has heavily relied on quality internet access and digital literacy in order to identify and secure appointments. Unpacking this dynamic, the Brookings Institution makes the claim that "digital infrastructure is a determinant of health."[305] In addition to many nontechnical fixes, such as advising that health departments partner with community organizations to canvass communities in person and via text message, Brookings recommends that engineers work with health equity experts to shape online systems that

"anticipate and design around equity challenges." Another example is the state-level infrastructure needed for delivery of unemployment insurance benefits. Researchers at the Southern Economic Advancement Project state:

> There is a direct connection between the hollowing out of state labor departments—and the move to automate agency programs… The dependence on automated software developed by contractors, which are far removed from the actual business of unemployment claims processes and decimation of state agency administrative capacity, led to, and continues to be responsible for the considerable lag in the processing and correct payment of unemployment insurance claims.[306]

These challenges with equitable digital delivery of public goods points us to the importance of treating procurement and vendoring of technology systems as policy choices with equity impacts.

Governments have a responsibility to evaluate the distributive impacts of the technologies they procure. Bianca Wylie, a Canadian public interest technology expert, emphasizes this imperative saying that "significant amounts of power and money are moving faster than ever in this moment. Some of that power and money is moving around in the public procurement of technology products that shape society in ways that do not support democratic governance."[307] From vaccine access to unemployment insurance access, the move to digitize essential public services necessitates a public body that can democratically govern what services are digitized, how they are digitized, and who benefits from this lucrative market. One vision for this governance is through federal policy that nationalizes and standardizes some of the state and local advancements in mandating impact assessments of procured technology, as suggested respectively in the Katyal and Farid pieces on human impact assessments and a federal-level regulatory body.

But there are more advanced proposals that take the government role beyond regulating and evaluating and instead view some technologies as a form of public infrastructure, such as transportation and energy. Ethan Zuckerman, director of the Institute for Digital Public Infrastructure at the University of Massachusetts at Amherst, describes digital public infrastructure as "the infrastructures that let us engage in public and civic life in digital spaces."[308] Zuckerman focuses on the brokenness of our media infrastructure to determine where we might start: reimagining social media networks in order to disrupt mis- and disinformation spread during the pandemic and political moments; building new online search systems that are transparent, contestable, and decentralized; and creating pathways to online revenue generation that are less dependent on click monetization and "surveillant capitalism." The governance of our current digital public infrastructure skews to large corporations mainly led by homogenous groups. In contrast, digital public infrastructures would push us to imagine public governance options, such as government-funded media platforms, cooperative ownership models, or the open collaboration model popularized

by *Wikipedia*. There is space to imagine new models of public governance and multiple models at once. Politico suggests that this process of creating public digital infrastructures could "be the right place to start exploring how to reinvent governance and civil society more broadly."[309]

Our intention in pointing out the importance of public sector intervention and investment in digital infrastructure is not to centralize the power of creating digital technologies with the state, but rather to see the government as a lever to broadening the creation, control, and use of digital technologies—which is why we need cultural interventions to strengthen communities' power to take this on.

Cultural and Community-Centered Interventions

Policy interventions and industry reform are required to address a world where the most powerful tech companies are richer than many countries combined.[310] There is a massive power imbalance between the creators of technology and technology's users, subjects, and even intended regulators. This power is imbued by the structures that gatekeep access to computational expertise, to governing power, and to some forms of knowledge. As the movement to resist the harms of AI and expand its promise advances, so must the pathways to building power of communities most impacted and to bridging among those in solidarity. The rapid growth and evolution of the tech industry has made digital technologies a critical component of our culture. Thus, we need cultural changes that broaden our collective understanding and ability to cogovern the technologies that shape our daily lives.

Grassroots tech development and governance. While the playing field for gaining computational expertise and capital is uneven, there has been traction on individuals and community groups designing their own technology solutions in the pursuit of public interest. An example of this is Appolition, a platform that crowdsources bail funds for incarcerated individuals. Developed by Dr. Kortney Ziegler, a Black transgender tech developer, the platform automatically converts users' loose change into bail.[311] After just two years, Appolition raised around $200,000 to bail more than 50 people out of jail across the United States.[312] Another example is Remitly, an app that set out to empower the economically disadvantaged and underbanked immigrant population by providing a tool to send remittances back to home countries without predatory fees that cost communities upwards of $50 billion annually.[313]

For the creation of grassroots technology to flourish, we need more financial pathways for funding community-led tech development. But, again, technological solutions alone cannot ameliorate the reasons why funds must be redistributed for mutual aid among those who cannot make bail or who have families to support in their home countries. The Astraea Lesbian Foundation for Justice compiled an in-depth set of recommendations for funders to identify their responsibility on both fronts of the cultural and political change needed.[314] Movement organizations need funding for political education of their members and constituencies on the harms of algorithmic technology created under dominant frameworks, as well as funding to build movement technology under community-centered frame-

works. And, importantly, this technology will look different from top-down technology created by Big Tech and venture-backed enterprises. Guiding principles for community technology, created by collaborators at the Allied Media Conference in 2015, emphasize this imperative and include "access, empowerment, privacy, ownership, resource sharing, and collective expression."[315]

AI technologies may have myriad known and unknown applications, as described in this report, but what they all have in common is a reliance on data and computational energy. Data is a resource to enrich technology companies and for users to access ostensibly "free" services. In addition to regulating how those at the top of our social and economic structure use this data, we can also reimagine how data is governed and created. Many pathways to this goal have emerged: democratically elected, rotating data councils and peoples' assemblies[316] or data coalitions[317] that can negotiate terms and conditions under which tech companies can utilize user data. Recently, Demos and Data for Black Lives, two organizations at the intersection of algorithmic justice and democratic rule, compiled recommendations to resist "data capitalism,"[318] including proposals to make data cease to be a commodity at all and create mechanisms for marginalized communities to exercise collective consent and democratic control over data and algorithmic decision-making that affects their lives.[319] These new visions of governance fundamentally disrupt the traditional relationship we have between data creators (users) and data stewards (companies).

Speculative technology to educate and organize against the status quo.
To further our cultural consciousness and understanding of technology's impact on our daily lives, activists and researchers are taking on both conceptual and practical technological projects that flip the same tools of oppression back onto people with power. White Collar Crime Risk Zones is a project by journalists at The New Inquiry developed to challenge our racialized notions of dangerous areas, of criminality, and of what crimes are worthy of surveillance. The platform uses predictive technology to map out places where financial crimes are likely to occur and create profiles of the common appearance of people who commit financial crimes. The developers are currently working on facial recognition training data pulled from LinkedIn and composed of over 7,000 faces of corporate executives who are overwhelmingly white and male.[320] This project intends to subvert the status quo application of surveillance and risk assessment technology, which is deployed disproportionately toward the neighborhoods, schools, and homes of communities of color in the United States. As another example, the Anti-Eviction Mapping Project has crowdsourced a Landlord Tech Watch tool "to fight landlord technologies in our homes and neighborhoods."[321] Landlord Tech Watch is an organizing project where tenants across the country can input data on their landlords and property management companies' use of technology, which can be used to automate evictions, enable racial profiling, and fuel tenant harassment. There are few laws and regulations governing the collection and use of data in the context of landlord tech, so Landlord Tech Watch is a community-based approach to exposing this gap in tenant rights.

An integral element to the creation of technology is design, and the approach of White Collar Crime Risk Zones may be referred to as speculative design.[322] By applying the methods of predictive policing that criminalize poverty to new subjects, the designers guide us not only to imagine a world where excessive wealth is instead criminalized, but also to interrogate the dehumanizing and othering embedded in surveillance and facial recognition technology. The more practical Landlord Tech Watch is a tool for popular education, mass mobilization, and organizing. Both approaches push us to question the status quo and imagine new futures.

User-led corrections of misinformation and media literacy. As the COVID-19 pandemic has revealed, social media can be a double-edged sword in the project of collective sense-making and information sharing in a public health crisis. In many cases, misinformation spreads like wildfire, often enabled by the underlying profit levers of our social media infrastructure. In other cases, social media is used as a powerful educational tool by health professionals to promote responsible public health decisions without the need for formal expertise in content development, editing, and promotion. For example, health-care professionals have taken to the viral nature of social media by using TikTok, an app that allows users to create, edit, and share short videos, to combat misinformation with their medical expertise on the front lines of the pandemic. Christina Kim, a nurse practitioner, shocked by the amount of COVID-19 misinformation she saw on the app, became an instant TikTok hit, gaining 50,000 followers and 1.7 million views after uploading a video where she donned two surgical masks together with an N95 mask while hooked up to a pulse oximeter with text that read, "Wearing a mask will NOT affect your oxygenation or cause 'carbon dioxide poisoning.'"[323] Kim continues to use her account to share health information and is one of a legion of health-care professionals and scientists using the platform most known for dance video challenges to gain a larger platform to dispel antiscience misinformation related to the pandemic.[324] Christian Assad, a cardiologist based in Texas, also among the TikTok legion correcting COVID-19 misinformation through videos, told Wired about the power of health-care professionals on the app: "We can treat only one patient at a time, but if we can get a message out there that can hit thousands or hundreds of thousands, then we can change their thoughts, hopefully."[325]

But, of course, the impact of this approach depends on who is making claims about science and what thoughts they wish to change. The explainer videos that a social media user follows will differ based on the algorithm that populates their Instagram, TikTok, or Facebook feed. A recent analysis on the common narratives about COVID-19, workers, jobs, and the economy reveals how narratives varied wildly based on your network.[326] Users connected to the right-wing ecosystem of GOP officials, right-wing media, and ethno-nativist social media influencers saw content geared toward rejecting "big government," reopening the economy, normalcy, and worker productivity.[327] Users connected to the ecosystem of progressive media

workers and organizers saw content geared toward the care economy and challenging the role of government to provide in a crisis. ReFrame also identified an ecosystem of medical and academic influencers serving as pre- and debunkers of mis- and disinformation across social media, mostly focused on narratives of safety and highlighting that "we are only safe when all of us are safe."

The range of narratives available to social media users highlights the importance of media literacy. Users have some limited means of shaping our newsfeeds across platforms, such as choosing who to follow, but algorithms can also suggest new organizations and individuals to follow, at times steering users directly toward partisan, unverified content.[328] On an individual level, ReFrame's partner organization PEN America launched the Media Literacy Project,[329] with toolkits and quick tips[330] to practice media literacy in our daily consumption of news and media. On a community and organizational level, ReFrame and PEN America launched a Disinfo Defense Toolkit to help community-based organizations and nonprofits get started. They recommend that organizations build mis- and disinformation mitigation strategies into all of their plans. Most of the recommended action steps focus on offline activities to identify and disrupt the spread of false information on- and offline, reemphasizing the point that technical fixes are not always the solution to issues fueled by technology.[331]

Healing and solidarity through digital spaces. The COVID-19 pandemic and the cell-phone-recorded death of George Floyd that circulated via social media apps weighed heavily on communities of color. Individuals recognizing the need for culturally competent mental health services for their communities have created online communities that provide a sense of belonging and validation in the face of the isolation of the pandemic and, at times, cultural stigma associated with seeking mental health services.[332] Carrie Zhang Zhang created the Asian Mental Health Project page on Instagram, where Zhang hosts a weekly check-in series called Stay in, Check in, featuring experts chatting with Instagram followers on physical and mental health topics from gut health to experiencing the trauma of rising anti-Asian discrimination during the pandemic.[333] Oakland-based clinical social worker and psychotherapist Erica Woodland recognized the need for identity-affirming services for trans and queer individuals of color when seeking mental health services where nonbinary individuals are labeled "dysphoric" by the practice.[334] Woodland originally founded the National Queer and Trans Therapists of Color Network in 2016 to help queer and trans professionals seek support for the same challenges their patients had, but has also provided individuals who lost access to their mental health professional during shelter-in-place with assistance in finding a therapist competent in relating to and recognizing nonbinary and nonheteronormative gender and sexual identity.[335]

While this landscape scan has highlighted the way technology can be problematic in targeting minority populations for negative impacts like hyper surveillance and negative health outcomes, communities of color

are also using digital spaces as forums to connect to and converse with individuals like them and obtain mental health support typically not offered in mainstream practices.

Decentering of computational expertise and building a broader coalition. Technology is dependent on the labor of those outside of the inner circle of tech company prestige and bounty. Individual user's engagement via clicks, shares, and reposts creates value that is neither acknowledged nor rewarded.[336] Contractors and digital homeworkers conduct unenviable tasks, such as moderation of hate speech or manually training algorithms to identify trends, for essential Big Tech services.[337] These forms of labor have not been valued or recognized appropriately in the tech industry, but there is a growing call to recognize the problematic nature of these labor constructs and the value of building power among this broader coalition of, perhaps nontraditional, tech workers.

And this recognition is being demanded from workers themselves, as seen in the creation of various worker collectives, such as the Tech Workers Coalition[338] and the Gig Workers Collective.[339] These collectives— sometimes taking the form of traditional unions, partnering with unions, or intentionally creating new organizing frameworks—are platforms for a broader coalition of workers to bargain for their own rights in the workplace, and for the rights of all of us who are impacted by powerful tech companies. As Khadijah Abdurahman puts it in conversation with Khari Johnson from VentureBeat, "there should not be some lone martyr going toe-to-toe with [Big Tech]. You need a broader coalition of people who are funding and working together to do the work." As an example, the Athena Coalition brings together warehouse workers, small business owners and advocates, and Amazon customers to build an economy where call can "enjoy the benefits of digital technologies and online commerce without having to sacrifice our rights and liberties, health and planet, or hopes and dreams."[340] The challenge ahead is to create the conditions for these broader coalitions to take shape. Our resourcing and ways of governing technology must honor the collective investment that has created a society and culture shaped by technology. This collective investment ranges from the US federal government's early investment of derisked capital into today's biggest tech companies to the labor investment of the lowest-paid tech workers across the globe. Cultural and community-centered interventions must be properly resourced and shaped as collective projects, with priority to moving funds to community-led projects.[341]

In summary, across all possible paths forward, we must contest with power. Our existing levers of power via industry reform and government regulation can do more to address tech industry power run amok. Within industry, ethics and corporate accountability measures should better guide an industry that has been trained to "move fast and break things," and the tech workers' rights to defend themselves, their workplaces, and the public good should be protected. At our various levels of government, regulation and legislation must rapidly bring our protections for privacy and civil rights up to speed to a new digital era. The digitization of public services is further

empowering the already powerful tech industry to capture more of the public domain, and we must fund public options for essential services that increasingly rely on digital infrastructure. Lastly, there is much to be learned from how marginalized communities are already charting more equitable paths with the tools that exist, such as developing apps and platforms to facilitate resource distribution and using today's social media platforms to educate and hold space beyond what is available in the mainstream. The path ahead requires new modes of collectively creating technology, governing technology and data in the public interest, and organizing a bigger "we" of tech workers and tech users, who can build these modes together.

Conclusion

During the current era of upheaval, technology is transforming societal arrangements. As a tool, it is being used to redefine borders between public and private space, expand the boundaries of corporate space, and influence *who belongs* in each. Consequently, technology is also being used to shape a fourth "non-public/non-private" space, which is the domain of those who are marginalized and *othered,* who lack privacy, rights and a voice in our democracy. In our examination of automated decision systems, surveillance tools, and social media platforms, we uncover how these technologies have been used as tools of othering, deepening existing structural inequities that determine individual and community health.

In this same moment, we find that many activists, scholars, researchers, public officials, and technologists are charting multiple paths forward of resistance to extractive, carceral, and otherwise harmful technologies, as well as new possibilities for technologies that expand belonging. These alternative visions indicate that technological tools themselves are not inherently problematic, but that the current system that governs technological production—in which a limited number of mega-corporations and profit motives dominate—is deeply inequitable. Opening up a pathway for ethical, equitable, and emancipatory technology necessitates major systems change. In this landscape scan, we have scratched the surface of what this change must entail and where it might lead, but further research and organizing is needed to illuminate a shared agenda and strategy for the future of technology centered on belonging. Rather than imagining a future driven by the pursuit of profits and automation, what if our pursuit of new technologies is driven by a global vision of a world where community health, well-being, and belonging come first? What would we build? What accountability systems would we create? Whose needs and concerns would we center?

As a starting point, AI researchers Rediet Abebe and Maximilian Kasy call for a redirection of the future of AI that "...includes a wider range of agents of change—especially those who have been left to the margins of society and bear a disproportionate brunt of the burden of algorithmic harms."[342] We must therefore begin by recognizing who is harmed by existing technologies built upon social, political, and economic systems of othering and extraction. Given the scale at which tech companies operate, this necessitates a global analysis of how power functions within the tech sector. While beyond the scope of this initial research, this sort of systemic analysis would illuminate key leverage points for intervention and transformation, instead of resigning our future to the vision prescribed by

the status quo. Additionally, we pose the following questions as potential directions for further research:

Taking a more global view of the economy, what are the linkages between the tech sector, speculative finance, and other extractive industries? What do these linkages mean for how the tech sector and economy at large must be regulated?

Furthermore, what do these linkages mean for how power within the tech sector can be contested? What other possibilities do they reveal for building bridges across different constituencies of workers, consumers, advocates, and members of various communities facing overlapping systemic injustices that are all shaped by the same power dynamics?

Finally, the landscape of technology continues to evolve rapidly, with new tools, cases, and impacts to be examined almost daily. Understanding how technology impacts health and its social determinants therefore requires an ongoing research endeavor. This initial phase of research highlights the importance of examining technology's effects not just in terms of individual health, but also societal health—in other words, how technology is impacting our democracy, social institutions, and ways of relating to one another as humans. Further research in this area is essential to advancing technological counterimaginaries as well as just possibilities for our entire collective future.

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