[Commentary] Building a digital republic to reduce health disparities and improve population health in the United States

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Abstract

Income, schooling, and healthcare are key ingredients for optimizing human's ecological niche for survival. But most government programs that are designed to provide a hand up in these domains are difficult to access. While many Americans struggle to pay taxes, few understand the difficulties associated with enrolling in Medicaid, Temporary Assistance for Needy Families. A remarkably small percentage of needy families receive the social benefits to which they are entitled, and that percentage is smaller for those most in need (those with physical disabilities, caregiving responsibilities). To address this problem, the Child Tax Credit in the American Rescue Plan provided automatic enrollment and worked hard to locate more low-income families. But until everyone has a digital footprint that allows automated enrollment, the sickest and most vulnerable citizens will remain in the informal sector. By expanding data systems so that all Americans have a digital identity across multiple datasets, it not only becomes possible for all Americans to simplify their lives but for welfare services to work for the most vulnerable, as they are intended.

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Introduction

Only well-off Americans are adroit at navigating the complex bureaucracies of banks, taxes, and licensure requirements required for day-to-day survival in a complex society. But failing to navigate these bureaucracies impacts not only Americans' wallets, but likely also their health. In this commentary, we describe how social services and government benefits can be automatically delivered to eligible participants by creating a universal digital identity that opens the door to turning the US into a digital republic.

Social benefits and population health in the US

Social benefits have long been hypothesized to improve health by providing key social goods that are needed for survival (housing, health care, education) to socially disadvantaged populations.[1][2][3][4] Recently, randomized controlled trials have shown that social policies that are effective at increasing economic well-being can also improve population health.[5]

For a social policy to improve health, though, it must also improve economic well-being. Unfortunately most social policies simply don't do what they are supposed to do (provide health insurance, deliver income support for low-income workers).[6][7] Perhaps the largest reason that social benefits fail to reach their recipients is that they are simply too difficult for the neediest Americans to access. Most social benefits require long forms and arduous proof of eligibility. The most prevalent and difficult barrier to leap is "means testing," which requires the applicant to prove that their income is below the threshold for benefit eligibility. Unemployed people can find it especially difficult to provide proof of income simply because they no paycheck.

In experimental trials of social benefits, participants are aided in filling out forms and finding documents needed to prove their eligibility. But even under these circumstances, only about half of eligible participants typically succeeded in obtaining tax credits, Medicaid benefits, or housing vouchers.[8][9] Clearly removing barriers to receive social benefits would help, but identifying eligible participants and automatically enrolling them would be better still.

Automating payments

Benefits that are ostensibly automatic do not reach all their intended recipients because the government simply lacks data on the most disadvantaged Americans. If one has never worked, is homeless, or works in the informal sector, he or she is unlikely to have a recorded address in which to receive a payment.

The American Rescue Plan passed under President Biden recognized that the neediest Americans were not all receiving economic stimulus checks.[10] As a result, when planning for the extended child tax credit, the Biden

administration charged the Internal Revenue Service (IRS) with the task of finding custodial parents that were missing in the IRS database, and then sending out checks. This was no small task for an underfunded federal agency. The IRS nevertheless managed to find many eligible parents and sent checks with no need to apply for benefits.[11]

The US misses the target

The average caregiver is probably less likely to have disabling mental illness or a physical disability than other recipients of social benefits. Therefore, providing custodial parents with an automatic child tax credit may seem like a relatively straightforward task. However, the government must first verify that the intended beneficiary is a parent, that the child is alive and living with the parent, and that the household income is under $75,000 if single or $150,000 if there are two parents filing together. Doing so requires a lot of secondary data that allows eligible recipients to be correctly targeted without the need for them to fill out additional forms.

In an ideal world, all social benefits would be similarly targeted. For instance, a self-employed worker with an income of $30,000/year may be able to afford most survival needs except for private health insurance, which could consume over a third of pre-tax income. Were public insurance (Obamacare, Medicaid) provided to this individual automatically, there would be no need for the worker to research cryptic insurance plans (with different deductibles and co-payments) or to fill out complex forms. When insurance is provided automatically, the recipient can devote more time to work and government agencies would need fewer workers to check paperwork. The key issues of finding those in need for services, targeting services to those with specific needs based on individual characteristics, and then enrolling them in services could be solved by the creation of a digital republic.

What is a digital republic?

Estonia was the first nation on earth to use a digital identity card to secure linkages between troves of individual-level data in order to bring all government services online, thereby building a digital republic.[12] In Estonia, each citizen has a digital identity that links all of the individual's data together. This allows the individual to live virtually, such that the government can continue to operate from another nation in the event of an occupation by Russia.[12]

Having a secure digital identity is central to running a digital republic; e-Estonia has not had a major data breach since 2007.[13][14] Sweden, China, and South Korea have also all been able to automate most of the tasks that we all need to get ahead in society—to obtain a loan, obtain a credit card, apply for university, or open a business. In China, a loan can be obtained in 3 minutes using a much more reliable predictive algorithm than is used by banks in the US.[15]

Were everyone able to participate in formal services (banking, licensing) while also receiving social benefits (housing, health insurance), economic and health disparities may begin to fade.

Improving privacy, reducing fraud

Digital identities underpin a digital republic. Typically, when a user logs into an email or bank account, that person's "credentials" are certified by a username and password. This is ideally followed by a second verification, such as a text message. An ultra-secure system might use a state issued card with a chip or a live satellite-linked code to verify that the user is who they claim to be. This secure credential ensures that "Tanya Jones" is the one who is accessing Tanya Jones' data within any given dataset.

When the identity is certain, it is possible to create a safe linkage between multiple encrypted datasets in both the public (Social Security, Department of Motor Vehicles) and private (bank, college) sectors. For example, a person applying for a job as a truck driver would provide the employer with permission to verify the applicant's employment history, licensure to drive a truck, and driving violations all while granting the employer permission to deposit paychecks by accessing each database.

An important element of this example is that the private information that the employer receives is limited only to that for which the user provides permission. In the US, if a customer wishes to buy alcohol, the storeowner is provided with the customer's name, driver's license number, and date of birth. In a digital republic, the storeowner only needs to know whether the person is over or under the age of 21, and this can be verified with a tap of the phone or ID card against a console. Age eligibility can even be encoded in the digital payment (credit card, Venmo) so that the purchase and verification happen at the same time. In this way, digital identities can increase privacy by returning control of one's identity and personal data back to the user. (But it does make getting a free drink on one's 21st birthday a bit more difficult.)

Setting standards

A set of transparent but secure international standards for identities, data formats, and data infrastructure have been developed, such as Trust Over IP.[16][17] Such standards are built on the concept of "self-sovereign identity," which gives a user control over access to their data and sets standards for data formats and use. Such standards are necessary if the US to implement a system like Estonia's while also increasing transparency. Standards for software work much in the same way that standards for hardware work; if all bicycle cranks have the same threading and size, then any pedal can be used on any crank. Likewise, databases built on the same standards become easily interoperable.

Proper data structures do not centralize data in one spot, but rather allow access to different datasets located in different systems. It is important to decentralize the data where it resides (the Department of Motor Vehicles, Unemployment Insurance) because it is unlikely that a hacker would be able to breach more than one system. This is one of the shortcomings of e-Estonia (while it there has not been a known breach in a long time, the centralized nature of the data system offers hackers a single target). This illustrates how different nations have different levels of success in achieving the self-sovereign identity required to operate a digital republic securely and effectively.

International successes and failures

That e-Estonia fails to de-centralize its databases highlights the difficulty in assessing how one should gauge a nation's success in building a comprehensive and equitable digital republic. While leading experts agree that Estonia offers all services online in an accessible way that protects privacy, not all agree that it is the ideal example of a digital republic simply because different experts have different ideas of what constitutes an "ideal."[18]

Certainly, China, a *Black Mirror* super digital republic, should not count even though it is cashless and automates tax filings. This is because it also tracks every text, email, and movement of its citizens some of whom disappear or are placed in camps. By contrast, data access in Estonia can only happen with user consent, and any citizen logging into Estonia.ee can see which agencies or companies have accessed their data.[19]

The *United Nations E-Government Survey*, for example.[20] It ranks nations baked upon telecommunications infrastructure, human capital, and online services. Thus, a nation can provide all services online in a very accessible and secure way but rank lower than countries than nations that score high in infrastructure or human capital. The United States is well known for its failures to bring government services to its people in a secure and private way (healthcare.gov, ID.me), for its continued reliance on cash, for private and public security breaches (Equifax, Office of Personnel Management), and for its atrocious privacy blunders (Cambridge Analytica, the Snowden files) but nevertheless ranks relatively highly in the United Nation's *E-Government Survey*.

While the UN's focus on the benefits of a digital republic for vulnerable populations is laudable, a much better way of viewing the world is to therefore assess whether it is possible to conduct all transactions online, the proportion of the population that does so, and how adherent those transactions are to standards. By these criteria, Northern Europe and Korea stand out. Both analog America and the super-digital republic of China would fail on privacy and protection standards no matter how advanced the telecommunications infrastructure is. Only after a system is accessible, secure, and private will a system serve its vulnerable.

How a digital republic might benefit population health

The effort required to achieve a digital republic in the US would be immense, but so too would be the health and economic benefits that might arise from such an effort. This is in no small part because a digital republic could provide targeted automatic enrollment in social benefits, such as public health insurance or income support, that reduce hardships like living in deteriorating housing, being a victim of crime, or being able to afford healthy food.[5] But being able to pay the bills produces health effects that extend beyond overcoming material hardship.

An analog life increases stress

Another way is by reducing psychological stress. Just as a car would be of little use if it could not gear up to climb a hill, humans would not survive without the ability to rev up the stress response to escape a large cat. But constantly revving an engine will cause the car to wear out quickly.[21] The stress response in humans produces neurohumoral changes like increased levels of adrenaline and steroids.[21] The result is wear and tear on the body's organs, damaging

health through a process called “allostatic load.”[22]

The hassles of daily living are stressful and take a health toll on the wealthy and poor alike. But this stress is probably much more acute and severe in socially disadvantaged groups.[23][24] If one cannot pay bills, these hassles are amplified (heat going off, collection agencies). A digital republic potentially revs down the human engine by removing the daily stress associated with navigating modern complex societies; less time is spent on automated phone systems and more time working and playing.

An analog life requires executive function skills

Just as stress takes a toll on the body, it takes a toll on the brain, making it more difficult for socially disadvantaged groups to perform basic tasks, such as opening a bank account and enrolling in bill payment. These tasks require “executive function” skills, which are located in the forebrain and atrophy quickly when a person is stressed.[25][26][27][28] If socially disadvantaged people are unable to engage in the hassles of daily living, they can enter a downward spiral in which poverty leads to poor executive function, which leads to lower earnings, which leads to worse executive function. Given this, it is easy to see why homelessness is growing rather than receding.

An analog life limits political participation

In addition to reducing material hardship (bad housing, crime), making it easier to participate in everyday society (paying bills, getting a license), and overcoming executive function deficits that are more common among socially disadvantaged people, a digital republic may also improve health by increasing political participation. As of May 2022, 27 states have enacted over 436 laws that restrict voting rights.[29] These laws disproportionately impact individuals from low-income households, racial minority groups, and younger US residents. As a result, these groups do not have elected representatives who can advocate for their survival needs, such as housing, healthcare, and education.[30] By reducing barriers to receiving social benefits, reducing stress, increasing access to everyday services, and increasing voter participation, a digital republic can potentially reduce health disparities will also potentially improving overall population health.

Precision welfare, precision public health, precision medicine

In the US, some medical providers continue to take notes on pen and paper. Big providers that require the use of electronic medical records systems sometimes find that systems in one clinic do not communicate with systems in another.[31] As a result, patients must re-enter their personal information on pen and paper forms when they are referred from, say, their primary provider to their dermatologist.

When data systems are unified, it saves patients time, reduces redundancy in the health system, and it also becomes possible to better understand how different treatments work in different populations.[31][32] Precision medicine becomes

possible because many years of data can be used to link a given treatment that a particular patient received with medical outcomes over time.

If a similar patient received a different treatment, outcomes associated with the first treatment can be compared with those of the second. Medical data are becoming sufficiently detailed that patients are not only defined by demographic characteristics, but also genetic characteristics. This might allow for highly customized treatment regimens to be added to clinical trials in the future. Big data-driven precision medicine is particularly important for racial and ethnic minorities, groups that tend to be left out of clinical trials.[33] Precision medicine and precision welfare could also serve as a form of precision public health, easing the social risk factors that drive premature aging and harmful environmental exposures thereby improving the health and well-being of the American public.

Frighteningly, the same paper and pen tools used in doctors' offices are sometimes used to record some disease surveillance activities in the US, too often by faxing information from one office to the next.[34] South Korea, which deploys sophisticated centralized public health and real-time tracking data systems, had an operational application for testing and tracking Covid-19 cases down to the street level within a month of the first case.[35] Taiwan, which is a world leader in unifying health data systems, had an operational system within three months of the first case. At the time of writing, three years into the Covid-19 pandemic, there was no way to track the crudest measures of progress such as tests or vaccinations in the US. Data were inaccurate and often hand summed from different sources (primarily thanks to a heroic effort by Johns Hopkins University). Had the US had a system for comprehensive data management at the individual level like South Korea and Taiwan, countless lives could have been saved, particularly among the most socially disadvantaged.[36][37]

Limitations

There are also drawbacks to digital identity schemes. Foremost, they must be implemented in a very user-friendly way to avoid increasing health and economic disparities rather than reducing them. The elderly, disabled, and homeless are groups that require special attention and will sometimes require personal assistance. Although many elderly, disabled, or homeless people have access to a cellphone and can use one, some people cannot. One solution is to open walk-in centers that provide digital services to those who cannot access them from their phone or laptop. A single point of in-person accommodation can replace a wide array of government and private services. In-person services must be run by government agencies that guarantee access in a secure way with highly trained workers and few geographic barriers to access or wait times. Access by people or institutions that provide custodial care is paramount. When data systems are fully operational, it is easy for the government to know who needs help and where.

Undocumented immigrants would also require special attention. At present, undocumented immigrants in sanctuary cities require a parallel system in which little by way of an identity card is required to enroll in social benefits. This would have to remain a parallel system.

A major limitation it that it is much easier to solve these problems in writing than in practice. From the management

of Hurricane Katrina to the rollout of Obamacare on Healthcare.gov, the US has a long history of failing where other governments have succeeded. Fortunately, Estonia's system is designed to be somewhat replicable, and its services can be purchased by other governments. (In fact, anyone can obtain an e-citizenship in Estonia for $100 Euros, though the benefit applies only to the virtual nation and not the geographic one.)

There are also other reasons to be pessimistic. Currently, the approach to digital identity schemes in both the private and public sectors within the US appears to be stealth implementation. Apple implemented biometrics to conveniently unlock a phone. It then subsequently used the data collected by the users for unlocking the phone to credential third party website logins. This includes logins to banks. While passwords can be easily changed, facial dimensions cannot. A data breach in Shanghai included the first large-scale case of biometric data theft. This is particularly dangerous in a country where facial recognition software is used not only for shopping and banking, but also for catching criminals.

These examples point not only toward reasons why it is important to ensure that self-sovereign identity is deployed, they also point to political risks associated with transparency. Rollout would take years. The longer rollout takes, the longer the process would be subject to the US' Machiavellian politics. However, as was the case in Estonia, the US faces existential threats to its dominance as a superpower, and these threats may create political momentum for change. Finally, while digital identities in theory eliminate the risk of voter fraud, modern-day politicians that wish to keep disadvantaged groups away from the virtual ballot box will find a way of twisting the narrative against a more secure system. Whether the same politicians view increasing efficiency in business affairs as more important than voting restrictions remains to be seen. In a federalist system, the voting guarantee afforded by digital identities may have to ultimately be granted by the state. Such laws have spillover effects onto non-minority populations as well.[30] If so, one can imagine a system in which health disparities are determined more by geography than by socio-economic advantage.

Conclusions

The challenges confronting American society in the second half of the 21st century are much broader and more complex than those in the second half of the 20th century, including ever growing differences between those with more or less education. But the technology available to address these problems is also exponentially more powerful. A digital republic can put privacy and security back in the hands of the user while greatly simplifying day-to-day tasks, making it a "no-brainer" policy tool. However, there are both business and political forces that resist this idea. Political minorities have a strong incentive to resist technologies that can surmount barriers to voting. Meanwhile, technology companies have a strong incentive to resist technologies that allow users to control their data.

Were automatic enrollment in welfare systems achievable in a Rawlsian world, then the remaining arsenal of welfare programs could, in theory, be targeted to individuals using predictive analytics

Welfare automation likely pays for itself many times over by targeting programs to individuals in need and ferreting out fraud, reducing government personnel, and advancing predictive analytics that can improve precision medicine and precision public health. Baby steps are needed, with automatic enrollment in public health insurance programs (Medicaid,

Indian Health Services, Obamacare) a logical first step.[38]

To make a digital republic equitable for all citizens, transparent standards that are vetted by experts can help secure the identity of disadvantaged and advantaged citizens equally. Doing so might not only reduce health disparities, but it might also produce large impacts on population health.

Ethics statement

No institutional review board approval was required.

Competing interests

The author is on the advisory board of Qeios. Peer review and article acceptance procedures are crowdsourced, and therefore independent of journal advising activities under the Qeios model. The author has no other conflicts of interest to declare.

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