Texas Advisory on Public Health Infrastructure Improvement

2020 Recommendations

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Revised 2021

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Overview: Texas Advisory on Public Health Infrastructure Improvement

The Texas Advisory on Public Health Infrastructure improvement was developed to recommend public health system changes that would improve Texas' ability to detect, prevent, respond to, and recover from a public health crisis. It should be recognized that Texas' public health response to COVID-19 pandemic has been exemplary; however, the crisis has brought to light opportunities for improvement in dealing with a pandemic. Communicable diseases, viruses or otherwise, do not respect boundaries and are agnostic to wealth status, race, religion, and political lines. They opportunistically march forward looking for susceptible hosts to infect, which can, on the one hand, wreak personal and family havoc and, on the other hand, consume health care resources, paralyze economies, and create a sense of insecurity. This report offers recommendations for consideration in the longer term "after the storm" to help mitigate against a future public health crisis and is not meant to address the acute and ongoing challenges of the COVID-19 pandemic that we are currently experiencing. However, lessons learned from the current pandemic and our response can and should inform analysis, discussion, policy changes that will create a system better positioned to effectively respond to future public health emergencies.

Overview: Texas Advisory on Public Health Infrastructure Improvement

Our Advisors provided their counsel in four areas for a high performing, responsive public health system for Texans: the workforce, data and technology, public health infrastructure, and ancillary recommendations. They addressed these topics with a critical focus on improvements in Texas' public policy and public health/population health practices looking ahead mid-term to long- term, months to years.

The Advisors focused their recommendations on mid and long-term system building and improvements that are enabled through the creation of dedicated funding streams.

> *"It is critical to the future health of Texas that we appropriately invest in public health to help prevent disease and to be able to respond swiftly and accurately to a public health crisis whether it be a pandemic or not. This requires a public health surge capacity, innovative ways of educating more public health professionals and the appropriate Information Technology infrastructure to be able to acquire reliable data, metrics and enhance communication among Departments of Public Health."*
>
> *Francisco G. Cigarroa, M.D. UT Health San Antonio*

Overview: Texas Advisory on Public Health Infrastructure Improvement

Advisors:

- John M. Zerwas, M.D. Executive Vice Chancellor for Health Affairs, The University of Texas System
- Francisco Cigarroa, M.D. Director of University Transplant Center, UT Health San Antonio
- Mary Dale Peterson, M.D., MSHCA, FACHE, FASA, Executive Vice President and Chief Operating Officer of Driscoll Health System
- Nancy Dickey, M.D. Executive Director, Texas A&M Rural and Community Health Institute
- Elena Marks, President and Chief Executive Office, Episcopal Health Foundation
- Angela Evans, Dean, LBJ School of Public Affairs
- Jaime Wesolowski, President & Chief Executive Officer of Methodist Healthcare Ministries of South Texas, Inc.
- Edward B. Burger, PhD, President and Chief Executive Officer of St. David's Foundation
- Greg Hartman, Vice Chancellor for Strategic Initiatives for the Texas A&M University System and Senior Vice President of the Texas A&M University Health Science Center
- George Roberts, Chief Executive Officer, NET Health
- Georges Benjamin, M.D. Executive Director, American Public Health Association

Overview: Texas Advisory on Public Health Infrastructure Improvement

The Advisors started with a set of consensus **PRINCIPLES** to guide Texas' public health policies moving forward. These include:

1. A comprehensive public health system that is resilient, adequately resourced, and data driven.
2. A system that is devoted to disease prevention and health promotion and is equipped to detect, investigate, and predict emerging threats and retain agility and capacity to respond effectively, when needed.
3. Proactive public health practices that are science-driven with adequate funding, competent staff, and well executed coordination and communication throughout all phases of a public health emergency.
4. A Texas preparedness strategic plan that will result in sustainable strategic capacity to successfully respond to future public health emergencies and needs.
5. A Texas public health system with sustainable funding and capacity to optimize the use of data and technology across multiple platforms to support the public health system's ability to competently and effectively assess and protect the health of Texans.
6. A Texas public health system that does its work with health equity as a goal, engenders the public's trust, participation, confidence, security, and even pride as a public health crisis ensues, is responded to, and recedes.

Overview: Texas Advisory on Public Health Infrastructure Improvement

The US public health system is fragmented in both organization and funding, with significant variability at local, county, and state levels. Nationally, public health spending represents 2-3% of total health spending. The inadequate funding undermines the health of individuals and families and places national security and economic viability at risk. COVID-19 has amply demonstrated that we can no longer accept or afford public policy practices that react to, rather than prepare for, public health crises.

The Advisors recommend we create a plan, fund the plan, train to the plan, and maintain the plan.

The Advisors wish to thank Anita D'Souza and Cailyn Stewart for their tireless volunteer support and dedicated guidance in researching and writing this report.

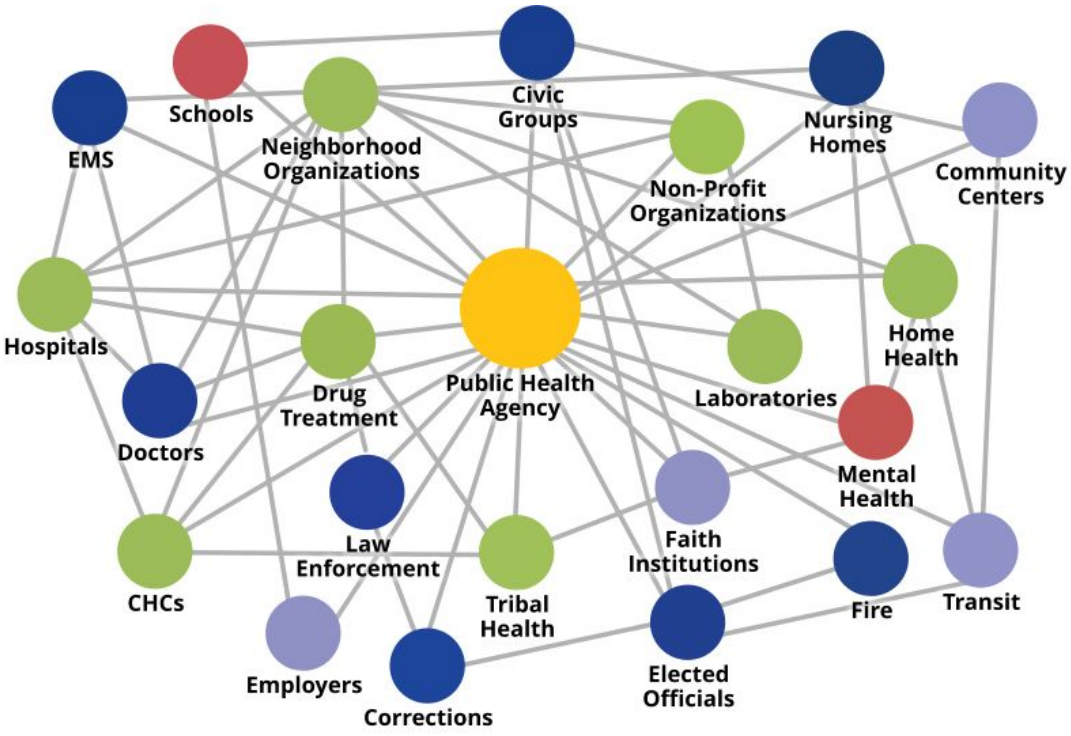
It is our intent and hope that these principles and recommendations are helpful to our state leadership.

Jon Comola, Founder, Wye River Group/
Texas Advisory on Public Health Infrastructure

> *"In Texas, we talk a lot about healthcare. But we don't talk enough about health. The poor health of many Texans, particularly Black and Hispanic Texans, and the disparate impact of Covid-19, are the product of social, economic, and behavioral conditions. This is where public health works—on the ground, in communities, with prevention-oriented, upstream strategies. When we invest in public health, we're investing in people, families, and communities."*
>
> *Elena M. Marks, President and CEO Episcopal Health Foundation*

Background

Public health systems are large interconnected systems that serve to protect the health of populations – particularly in times of public health crisis. In Texas, public health has to have the capacity to serve the public health needs of 29 million people living in urban, rural, and border communities.



Source: https://www.cdc.gov/publichealthgateway/publichealthservices/essentialhealthservices.html

Ten Essential Public Health Services recently revised by the Centers for Disease Control delineate the requirements of a complete public health system, which includes social determinants of health and preventive care.

Background

The 10 **CDC (Centers for Disease Control)** Essential Public Health Services (revised in 2020) are as follows:

1. Assess and monitor population health status, factors that influence health, and community needs and assets
2. Investigate, diagnose, and address health problems and hazards affecting the population
3. Communicate effectively to inform and educate people about health, factors that influence it, and how to improve it
4. Strengthen, support, and mobilize communities and partnerships to improve health
5. Create, champion, and implement policies, plans, and laws that impact health
6. Utilize legal and regulatory actions designed to improve and protect the public's health
7. Assure an effective system that enables equitable access to the individual services and care needed to be healthy
8. Build and support a diverse and skilled public health workforce
9. Improve and innovate public health functions through ongoing evaluation, research, and continuous quality improvement
10. Build and maintain a strong organizational infrastructure for public health

Background

The 10 **Texas** Essential Public Health Services codified in state law in Texas (originally developed in 1994) are as follows:

1. Monitor the health status of individuals in the community to identify community health problems
2. Diagnose and investigate community health problems and community health hazards
3. Inform, educate, and empower the community with respect to health issues
4. Mobilize community partnerships in identifying and solving community health problems
5. Develop policies and plans that support individual and community efforts to improve health
6. Enforce laws and rules that protect the public health and ensure safety in accordance with those laws and rules
7. Link individuals who have a need for community and personal health services to appropriate community and private providers
8. Ensure a competent workforce for the provision of essential public health services
9. Research new insights and innovative solutions to community health problems
10. Evaluate the effectiveness, accessibility, and quality of personal and population-based health services in a community.

In 1999, the Texas legislature passed HB 1444 (Representative Dianne Delisi and Senator Mike Moncrief) that defined and set a strategy for implementing the 10 essential public health services in Texas.

Background

"Disasters frequently have those famous silver linings. Clearly the learnings from the COVID 19 pandemic will have many lessons that will prepare us for future disaster conditions. Certainly, the availability of domestically produced PPE is at the forefront. Better state of the art IT such that decisions can be made in real time is essential to better public health response. Reassuring is the capability of our health care systems to absorb the surge of patients. And the ability of our research universities to quickly identify effective treatments has proven the value of this investment in higher education."

John Zerwas, MD Executive Vice Chancellor for Health Affairs, The University of Texas System

Executive Summary of Recommendations

Recommendation 1: **Improve the capacity of the public health workforce by increasing epidemiology capacity for communicable disease, noncommunicable disease (including mental health and substance abuse) and environmental factors; investigate the use of workforce extenders and educational training to work in public health.**

Recommendation 2: **Create & train surge capacity workforce. For example, use a certification program and workforce extenders.**

Recommendation 3: **Update existing Information Technology (IT) platforms and integrate new platforms to support state of the art data acquisition, data storage, and data management that optimize epidemiological analysis.**

Recommendation 4: **Leverage and integrate existing databases to increase the ability to conduct real-time data analysis.**

Recommendation 5: **Ensure equitable broadband access across the state.**

Recommendation 6: **Create a stable funding source for public health.**

Recommendation 7: **In times of public health emergencies, activate an incident command system to stand up a communications and collaboration infrastructure capable of informing the public, addressing dis- and mis-information, communicating with the field, and providing for coordination within/between health departments, clinical care systems, social services, schools and businesses.**

Recommendation 8: **Address local and regional variation of Public Health authorities in urban and rural areas by creating a quasi-governmental Council of Government (COG) type of multi-county resource pooling for data, services and programs and increase the number of accredited health departments including DSHS and not yet accredited local health departments.**

Recommendation 9: **Prepare for the future health related resource needs of Texans. For example, resources needed in mental health, post-covid19 complications, avoided care.**

Recommendation 10: **Build the system that can "know" in real time the health status of individuals to enable appropriate mobilization of health and health care resources.**

Recommendation 11: **Create an electronic passport/health record for epidemiological purposes.**

Workforce

Recommendation 1: **Improve the capacity of the public health workforce by increasing epidemiology capacity for communicable disease, noncommunicable disease (including mental health and substance abuse) and environmental factors; investigate the use of workforce extenders and educational training to work in public health.**

Public health functions require the efforts of many different types of professionals: public health physicians, tropical disease experts, HIV specialists, medical directors, management policy advisors, public health veterinarians, public health lawyers, and public health dentists, for example. This writing principally focuses on epidemiologists.

Epidemiology is the study of the distribution and determinants of health-related states and events in specified populations and the application of this study to the control of health problems (www.cdc.gov). Epidemiologists are to public health what cardiologists are to heart health. Texas has slightly more epidemiologists than the national average on a population basis (0.0252 per 1000 vs national average of 0.0226 per 1000 people), the distribution varies across the state with large areas of the state without this resource to help with disease outbreaks or other public health emergencies.

Six of the 25 most populated cities in the US are in Texas, but nearly half of the epidemiologists in Texas work in the Houston metro area.

> *"The arrival of the novel coronavirus 19 amplified the extant weaknesses of our current public health care system. It revealed with brutal clarity the lack of access to adequate health care, especially among the most vulnerable; the disruption a pandemic can cause to care for non-pandemic, critical patients; the severe pressures on health care providers both in terms of*

emotional stress and overall capacity; and the consequences inconsistent and inaccurate communication. It also helped us see the value of data and evidence in making public health decisions, the power of networking and collaborations among caregivers, and the role technology can play in health care delivery. *The real challenge now is to learn from these experiences: To fix failures and adopt successes to achieve a ready, robust, and accessible public health care system.``*

Dean Angela Evans, LBJ School of Public Affairs

Table 3: Epidemiologists in the public sector by Texas Region.

Epidemiologists in Government	
Texas Total	240
Austin-Round Rock	60
Dallas-Fort Worth-Arlington	40
Gulf Coast	60
Houston-The Woodlands-Sugar Land	60

Epidemiologists are crucial members of any pandemic prevention and response. There are other occupations that exercise skills similarly to the skills of epidemiologists including anthropologists, economists, environmental scientists,

geographers, statisticians, health educators, nurses, actuaries, and numerous other professions. Many of these jobs collect and analyze data, study human behavior, use science, and problem-solve and should be part of a 'reserve pool'.

Increasing the governmental public health epidemiology workforce in Texas requires recruitment and incentives along with more funding for training programs. More public sector positions need to be created and funded to better support the state's health department and local health departments in tracking and managing communicable disease activity. According to the U.S. Bureau of Labor Statistics (BLS) , epidemiologists require a master's degree in public health or any related field, and some have PhDs in medicine or epidemiology. The field of epidemiology is expected to grow at about 5%, which is average for all national occupation projections from 2018-2028 but does not account for the rapid population growth projected for Texas. With a population projected at just under 35 million by 2030 and over 47 million by 2050, epidemiology positions must grow significantly to keep up with the population.

Workforce

Recommendation 2: **Create & train surge capacity workforce. For example, use a certification program and workforce extenders.**

> *"The pandemic has been a harsh reminder of the importance of bed capacity, surge staffing challenges and access to broadband. Even when rural hospitals had available beds and/or innovative solutions, they struggled with workforce and/or connecting patients. Rural Texas hospitals support these public health recommendations because every Texan matters and we can do better."*
>
> *John Henderson, CEO, TORCH*

Public health emergencies take many forms - they can occur as a result of a natural disaster like a hurricane or infectious disease outbreak or a man-made disaster such as a chemical spill. They can be limited by geography or time or be global, such as a pandemic. Public health emergencies can appear suddenly with little or no warning or they can build slowly over time. Each of these scenarios involves different skill sets and workforce requirements. Therefore, it is extremely difficult to precisely anticipate the size and qualifications of the workforce needed during any given public health emergency, and strategies to address surge capacity should be part of a long-term plan to address public health preparedness.

In health and healthcare, there are different facets to surge capacity – communicable disease investigation and contact tracing as well as hospital beds, ICU beds, and clinical care workforce. This recommendation focuses on public health surge capacity defined as the ability to implement core public health activities, such as risk communication, epidemiologic analysis, and contact tracing.

Workforce

During a severe outbreak, an epidemic, or a pandemic, these core responsibilities are the basis of all decisions made during a public health response, including communication to residents of the state or local community, allocation of resources within the state, and mitigating the effects of the crisis on the state. While certain activities require a highly technical skill set, such as epidemiological analysis, other public health activities require less technical skills for which training, such as contact tracing skills, can be provided.

Once core public health workforce and capacity as well as estimated public surge need in a worst case scenario is assessed, Texas should look at options to create a surge/reserve workforce that is available and can be activated to supplement existing assets and identify the public health training available or needed as well as the arrangements that might be operationalized (for example, telemarketing organizations and trained employees might be able to augment contact tracing related work). Currently, Texas Commissioner Dr. Hellerstedt reports that his agency contracts with various professionals locally to be able to control quality and have them available at the flip of a switch.

The US Military maintains a surge force that can mobilize in times of crises. This is a practice Texas should consider for civilians to help Texas be better prepared for public health crises in the future. A surge force or reserve could be trained to support front line public health and healthcare workers in contact tracing, testing, performing logistical support, food distribution and disinfection and provide relief to exhausted public health and medical staff. When not deployed, this reserve would be working their usual jobs in their communities. Maintaining a pool of trained reservists and keeping their skills current through periodic training would ensure that Texas has the personnel needed to successfully overcome the many challenges of a health crisis. Our Advisors suggest we should expand the option of Bachelor of Arts in Public Health within more Texas universities and expand

opportunities for students to be placed in experiential internships in health departments across the state.

Data and Technology

Recommendation 3: **Update existing Information Technology (IT) platforms and integrate new platforms to support 'state of the art' data acquisition, data storage, and data management that optimizes epidemiological analysis.**

Disease detection and investigation are the cornerstones of a public health response. Our Advisory members report that Texas experienced challenges during the current COVID- 19 outbreak caused by incompatible systems, changes in reporting requirements, and lags in reporting positive cases from labs resulting in missed opportunities for contact tracing. According to CDC, it involves the ongoing and systemic collection, analysis, and interpretation of health-related data for public health practice. Public health actions during a pandemic depend on timely and accurate detection and investigation along with flexible systems that can adapt as necessary.

Data that public health relies upon comes from a variety of sources: patients, health care systems (electronic medical records), public health entities (including public health laboratories), clinical laboratories, pharmacies, schools. In Texas, public health entities encompass local health departments, local health units, and public health districts and their laboratories, if they have them.

Data and Technology

The number of systems and the manner in which these systems collect, store, and transmit data affects the accuracy and timeliness of data available in a pandemic. Texas has made strides in syndromic detection and investigation. The Texas Department of State Health Services (DSHS), "in collaboration with local health departments across Texas and with Tarrant County Public health and Houston Health Department...has established a statewide syndromic network" that helps "identify emerging health threats and inform local decision-making while protecting individual's privacy."

Timeliness and accuracy of data are paramount during a pandemic. Epidemiological analysis must be made on hour-to-hour or daily data in order to provide the most up-to-date information to public health and other emergency personnel, communities, policy makers, elected officials, and other decision makers. Texas should continue to improve on current data collection while considering optimal approaches.

Today, there are new technologies that are changing both the ability to collect data and the type of data that can be collected. Cell phone technology can provide multiple types of data: location data; activity data, self-reported data as to an individual's condition via apps.

One example of an app is AREA (Application for Rapid Epidemiology Assessment) supported by the Office of the Secretary of Defense and Defense Health Programs. AREA is a mobile application designed specifically for bio surveillance and health crisis resiliency. The app helps health workers identify and obtain the most critical information to assess and mitigate health risks; distribute these data in a secure and curated way, optimizing cross-organizational resource allocation. AREA provides situation awareness, comprehension, and projection of relevant on-the-ground information.

Data and Technology

The AREA app combines state-of-the-art social networking technology with algorithms for assessing risk and managing distributed resources. The app is designed for application in all phases of public health or humanitarian crisis management, from Early Detection/Onset to Response/Relief and Recovery/Transition.

In summary, quality data that can be collected in real time can support contact tracing systems, state public health systems, and help private health entities make better data-dependent decisions. In addition, schools, universities, and employers would also be able to make better decisions. Continued standardization and consolidation of data systems to streamline data input and availability and the introduction of new technologies is essential for the timely and robust epidemiological analysis required in pandemic situations.

Data and Technology

Recommendation 4: **Leverage and integrate existing databases to increase the ability to conduct real-time data analysis.**

> *"I am still in full COVID mode. We are still seeing huge numbers of cases in South Texas with an inadequate public health infrastructure to address. The State has come in to provide help but now I don't know where we are in the pandemic- 1,500 cases have been added in the last 2 days, but we aren't sure that those numbers are current. We are hearing that those are numbers from the State that are just now getting into our system, but don't know how far back it goes. So, there are 2 issues. Inadequate real time data systems as well as not having a trained reserve force to manage these surges."*
>
> *Mary Dale Peterson, M.D., MSHCA, FACHE, FASA, Executive Vice President and Chief Operating Officer of Driscoll Health System*

Data plays a crucial role in disease detection and investigation at the local and national level. There are various types of crucial data, such as patient medical records, available hospital beds, regions with higher infection rates, laboratory results, etc, that medical and public health professionals use to assess public health situations. The data collected from various institutions such as hospitals, health centers, state agencies, and search engines can be analyzed by epidemiologists and others to monitor the status of a crisis and accurately create an appropriate response. Data can determine where vaccines should be sent, hotspots of new cases, and which populations are most at risk for certain outbreaks. With the emergence of large scale health crises, such as the novel coronavirus, the ability to compile and analyze wide intersections of real time data are imperative not only as a matter of national security, but as a necessary step in mitigating potential threats to human life, the economy, and the security of our nation.

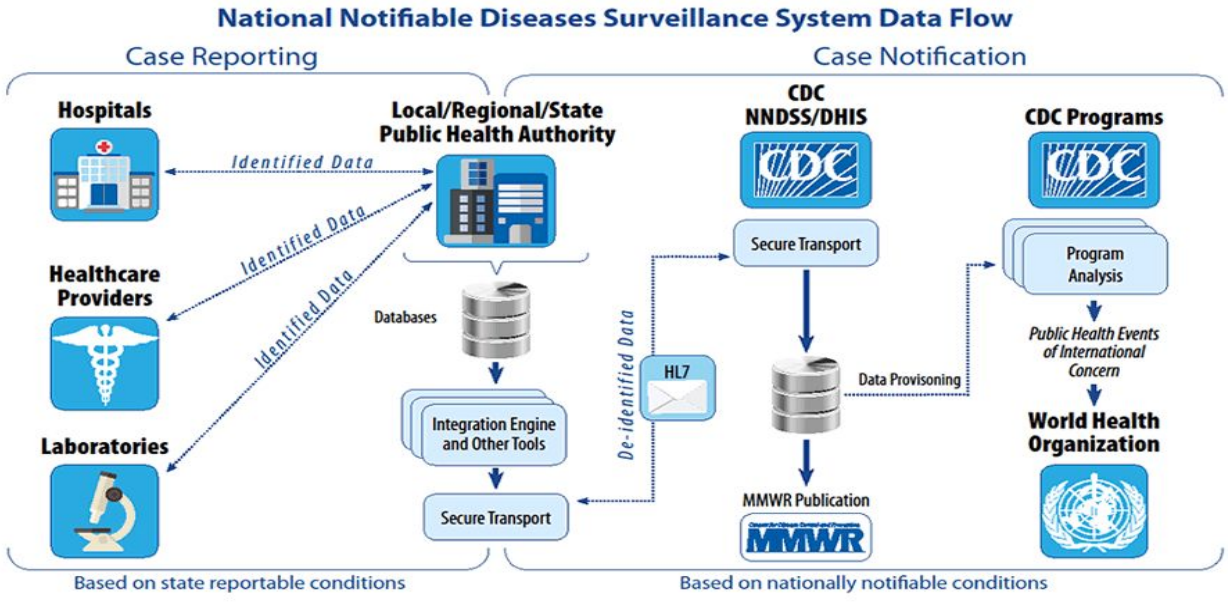
Data and Technology

"This situation highlights how the current approach to quality and safety measurement remains too labor intensive, contains significant data lags, and lacks sufficient standardization that allows for rapid sharing of data." - Allen Kachalia, MD

Traditionally the United States has utilized a variety of sources. Most recently, and perhaps most promisingly, agencies have begun looking into data that can be collected on smartphones and other devices. Policymakers should consider the applications of new technologies that collect data, as well as standardizing the means of collecting and transmitting data in order to enhance interoperability

The History of Data Collection

Historically, policy makers and public health authorities have utilized health data to monitor the health of a population. The main source of data typically originate from hospitals, health providers, and laboratories that reported cases as the patients were admitted.



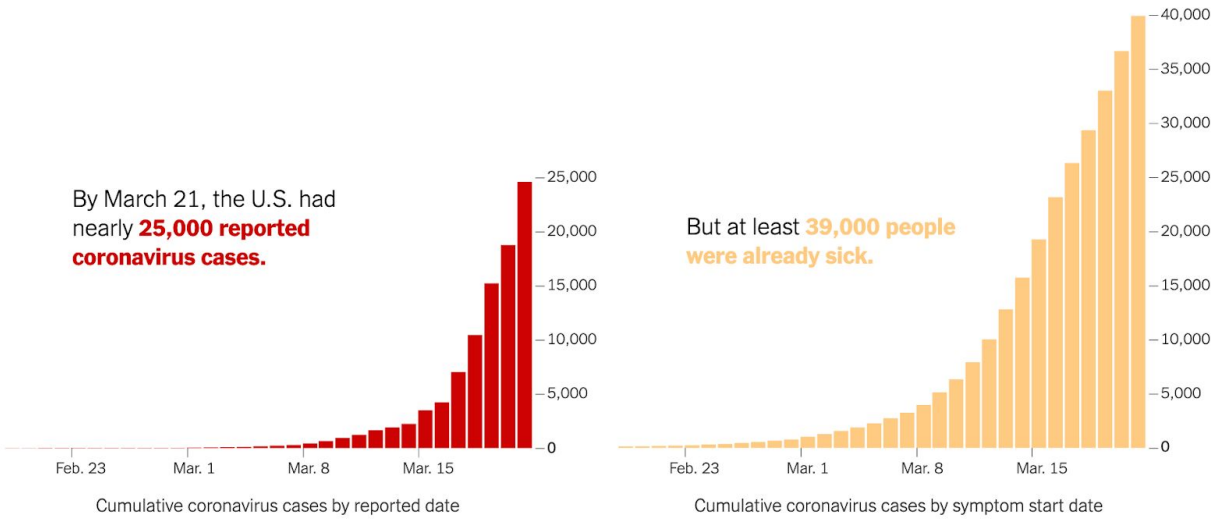
Currently this data is completely reliant on the cooperation of various institutions. The lack of interoperability and absence of a standardized reporting protocol, results in varying formats of data across hospitals, providers, laboratories, and agencies. This creates difficulty in verification and interpretation. Similarly, rural hospitals are often left behind the bell curve when adapting to modern technology due to discrepancies in funding, connectivity and manpower. It was noted, during the pandemic, that reports from rural Texas hospitals are often hand-written, faxed, and then manually inputted by public health employees. In health crises, requiring real-time data collection, this barrier poses a significant concern for Texans and Americans.

Passive disease detection and investigation is efficient for monitoring large areas and regions, but loses effectiveness on the individual level, according to Peter Nsubuga, co-author of *Public Health Surveillance*. Distinct data collection methods between the different agencies further complicate the availability of health data. Not only can methods vary between medical institutions as discussed above, but also within the government at the federal, state and local levels resulting from a lack of unification on data collection and reporting. Each level of government invests in their own data collection system and these mechanisms of data collection differ significantly depending on local, state and federal rules and regulations and the accessibility of funding. Since each state operates with its own unique data collection method, interoperability and unification of data between states and even between counties is difficult. Healthcare systems in the United States, unlike other nations, are disjointed and, as such, data collection during national and global health crises are hindered. The lack of standardization between these varying medical institutions and government agencies add to the complexity of sharing and analyzing data that are necessary for a rapid response. The principle of interoperability is crucial within the context of disease detection and investigation. The accessibility and ability to synthesize data from a variety of sources to create real time analyses to any public health crises hinges upon the interoperability of data.

Moving Forward with Timely, Accurate Data Collection

The United States does have current systems in place to collect data on health and transmission of diseases, the COVID-19 pandemic has demonstrated a need for a more uniform and regulated system to help halt disease spread in times of crisis. Currently, each institution gathers different information from their patient. For example, a hospital may collect race and socioeconomic data, but a laboratory may only collect age and name, making it difficult to build a holistic profile of patients. Standardization would increase efficiency and ease of collecting health data, allowing for easier transmission of data between necessary entities. Vulnerable populations such as the LGBTQ community, rural communities, and uninsured populations are the most harmed by our current lack of interoperability. These populations are the most susceptible to gaps in reported data and are most likely to be harmed by public health crises. By increasing interoperability, we can improve the health of all Americans and Texans, including our vulnerable populations.

Data and Technology



Developed countries within the Organization for Economic Co-operation and Development (OECD) have found success in increasing data collection and interoperability. Countries such as Singapore and South Korea were able to limit the spread of COVID-19 in 2020 due to robust health data collection, contact tracing, and streamlining data transmission by improving interoperability. South Korea, for example, has invested in epidemiologist centers across the country, capable of not only collecting data from that area, but also analyzing it on site before sending it off to the government. This approach allows South Korea to have a constant flow of up to date information on disease trends across the country. Taking advantage of the many technological advancements accessible to the United States to rapidly collect data at the individual level can lead to greater effectiveness at managing the impact of future health crises. Physical devices such as smartwatches and smartphones can utilize blue-tooth for contact tracing and tracking down potential exposures. Applications and search engines such as Google, Facebook, and Apple can display the largest pools of data at real-time speeds. These methods are not perfect and straddle a fine-line between personal privacy and public well being, but further investment, research, and regulation can provide a new source of public health data to monitor and mitigate future and current health crises.

Conclusion

The existence of up to date and comprehensive health data is necessary for public health officials, policy makers, and the general public to anticipate the populations public health needs. During the COVID-19 pandemic, we have seen the need for uniform, real-time data collection to aid in the distribution of medical technologies such as ventilators and hospital beds. Having a solid and reliable foundation for data collection and transmission is imperative for securing the public safety and preventing avoidable casualties of US citizens. Traditional sources of medical data coming from hospitals, laboratories and healthcare providers are beneficial for tracking regional developments, but nationally we continue to lack a streamlined, standardized methodology to present data accurately and in real time. Ensuring interoperability between these already existing systems and health data collecting entities is imperative to securing accurate and timely health data useful for disease detection and investigation.

"America needs an automated, near real-time means to collect symptoms and confirmed case information consistently and comprehensively so that it can be shared between and among multiple stakeholders, including federal, state, local, territorial and tribal public health authorities." - Premier

Medical data collecting advancements, such as the utilization of bluetooth technology for contact tracing and smartphone applications ability to monitor individuals movements, have shown to be successful in other countries within OECD. Additionally, these innovations have great potential in reducing the amount of people historically neglected from traditional health data sources. These reforms are great steps forward in ensuring the security of citizens and timely responses against public health emergencies. Although the current public health data infrastructure flaws have been exposed by the recent COVID-19 outbreak, investing in the development and advancement of this field is a tangible way to ensure policy makers and public health officials have accurate resources to make well informed decisions.

Data and Technology

Recommendation 5: **Ensure equitable broadband access across the state.**

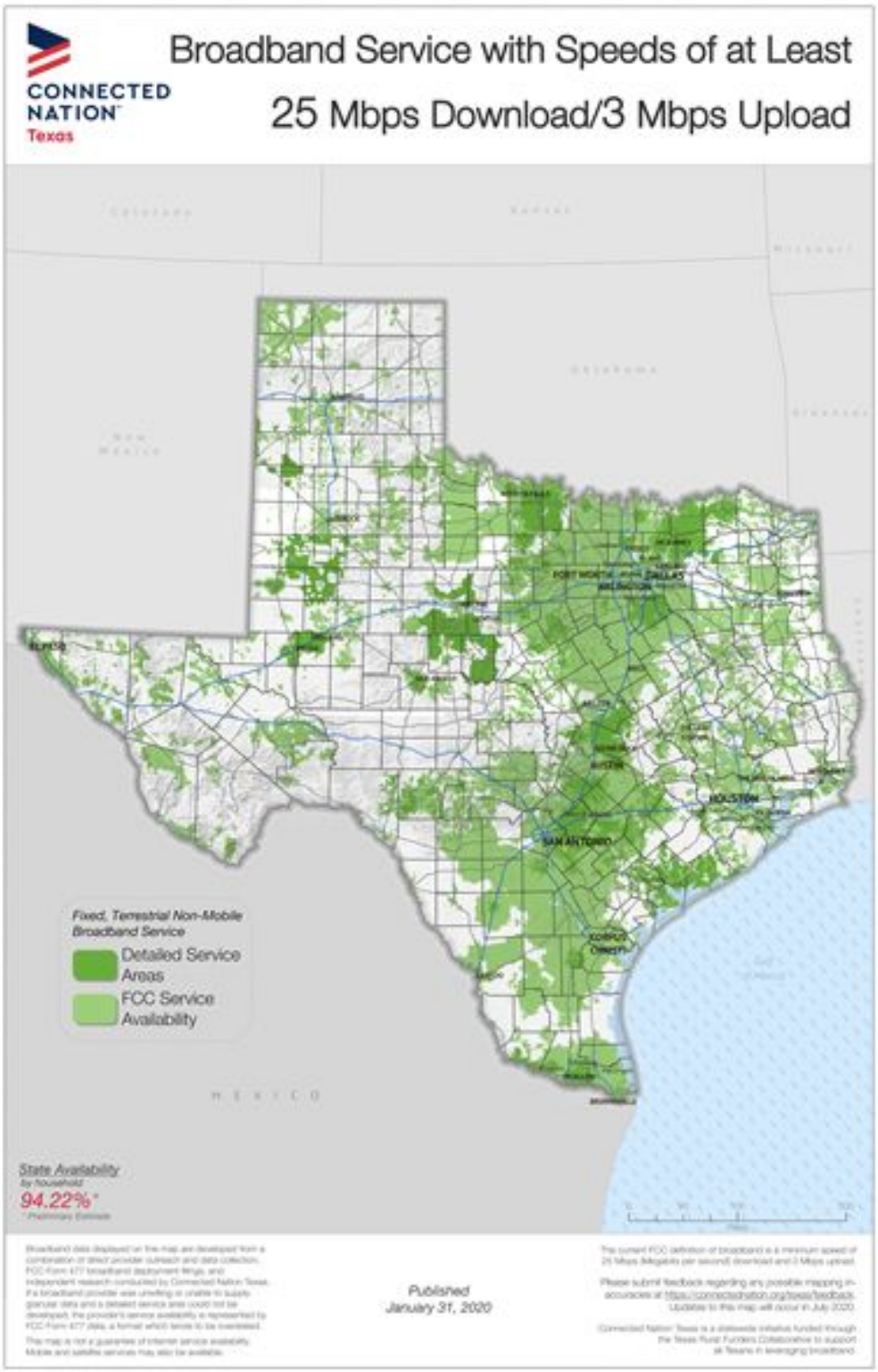
> *"The United States has benefitted extraordinarily from the construction and maintenance of the National system of Interstate and Defense Highways. Society has changed dramatically since the 1950's and it is beyond time that we do for broadband connectivity (and the people of the US) what Eisenhower did for transportation connectivity more than 5 decades ago."*
>
> *Nancy Dickey, Executive Director, A&M Rural and Community Health Institute*

Texas policy makers recognize the importance of ensuring all Texans have access to broadband. Passage of SB 14 in 2019 empowers Texas electric cooperatives to deploy broadband to the members they serve by allowing them to utilize their existing electricity easements. More can and should be done.

Whether it is working or studying from home or having access to telehealth during COVID - 19, rural Texans are particularly at risk. Before COVID - 19, rural Texas has experienced a significant decline in primary care physicians and therefore less access to medical care. Connectivity through telemedicine can help overcome reduced physical access to care.

Public health, health status, and connectivity are co-dependent. Internet connectivity is playing an increasingly important role in health, health care and public health. The use of telehealth to deliver healthcare, public health services and health education from a distance is changing clinical care and health related services and is dependent on broadband availability. Patient monitoring (particularly home-based cases) and contact tracing are examples of its benefits in the public health realm; whereas, patient monitoring, medication monitoring and follow up for chronic conditions and connecting providers are examples of its benefits in the clinical realm.

Data and Technology



Data and Technology

An estimated 24 million persons in the U.S. live in “digital deserts”, 19 million in rural areas. Access to broadband across Texas is a critically high priority particularly during a public health crisis but also during normal times. Connectivity has a direct impact on productivity gains, increased wages via sharpening skills, educational tools, information flow on local issues/civic engagement, entertainment and social networking/communication connectivity. During the current pandemic, schools in Texas are relying on broadband to conduct classes and likewise employers rely on this as well for work at home during lock-downs and quarantine. An estimated 34.4% or 1.8 million Texans in rural, suburban, and urban households do not have broadband.

Given broadband’s role as a moderating determinant of health, digitally isolated communities may risk worse health outcomes due to limited access for educational and economic opportunities and limited access to high- quality health services. To achieve equitable broadband access in Texas , it is imperative that we understand how our laws and policies governing telehealth and broadband access affect health outcomes.

Public Health Infrastructure

Recommendation 6: **Create a stable funding source for Public health.**

> *"COVID-19 has shown the nation the value of a robust public health system and the need for strategic and sustained investments in public health. The health and economic wellbeing of the nation depends on it."*
>
> *Georges C. Benjamin, MD, MACP, FACEP(E), FNAPA, Hon FRSPH, Hon FFPH, Executive Director, American Public Health Association*

In the U.S., 97 cents of every health dollar go to medical care and only 3 cents to public health! Many argue that the imbalance needs rebalancing.

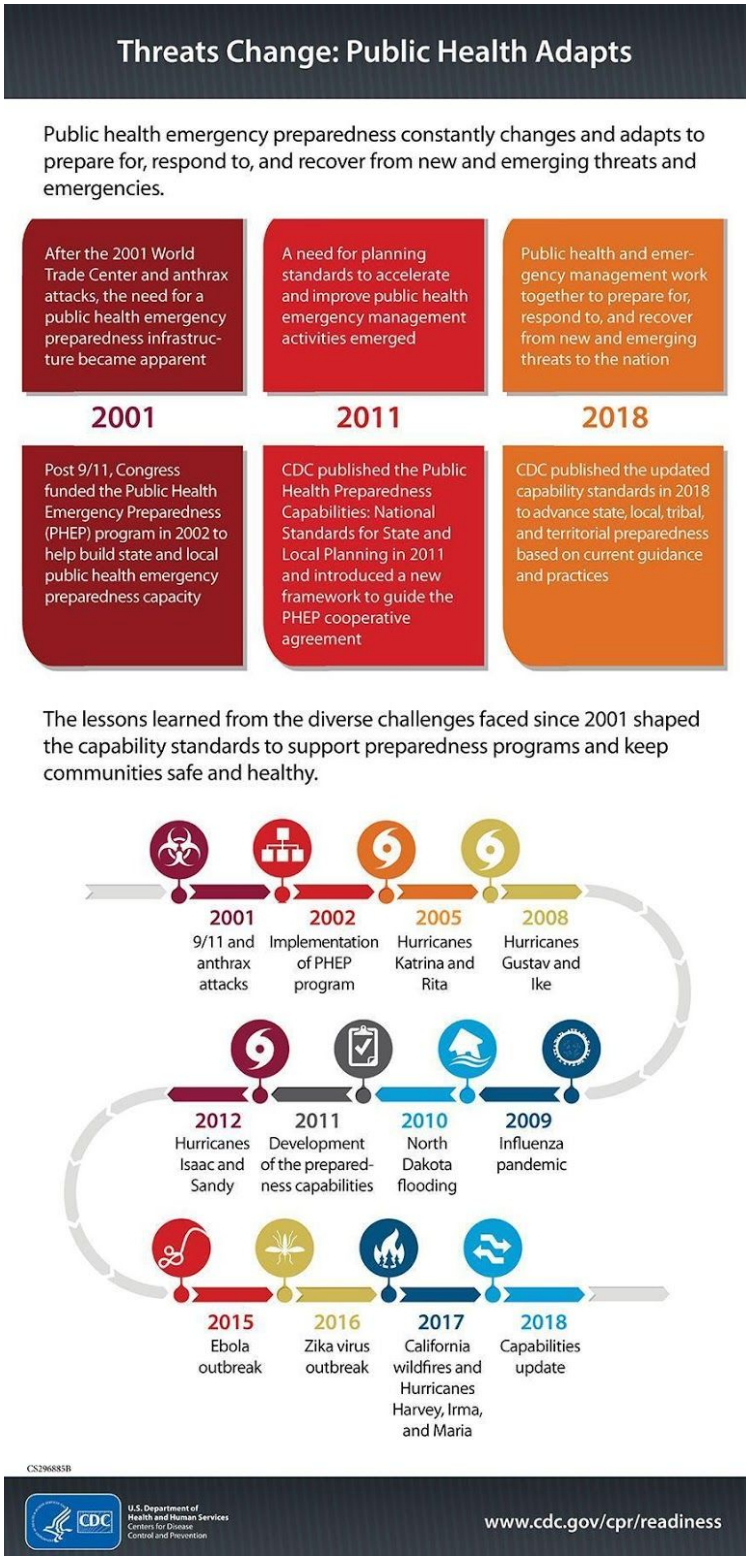
We have two health care systems: public health and health care delivery. They operate mostly independently in silos. At this time of the COVID pandemic, public health works to prevent people from getting COVID-19 and the health care system treats those sickened with COVID-19. The science and practice of public health is focused on the health of the overall population (population health), concentrating on being a catalyst for things like safe food, clean water, vaccines, injury prevention, clean air, sanitation, and control of communicable diseases such as COVID-19. In the U.S., public health is under-resourced and underappreciated until there is a crisis. But managing disease outbreaks is not a new idea and is why, in 1879, Texas Governor Oran Roberts was made head of a state health department, called the Texas Quarantine Department, with authority to appoint a state health officer.

In the U. S., we tend to be reactive to public health crises instead of proactive. Following September 11th, 2001, and the terrorist attacks and anthrax attacks a month later our policy makers devoted attention and resources to public health. They committed resources to expand our strategic national stockpile and create a project bio shield.

But this energy quickly waned and funding for public health facing organizations such as CDC has decreased over the past decade. This responding to crisis and then relaxing our attention is a pattern followed repeatedly in U. S. Public Health history. Those choices haunt us today in the wake of 4,649,102 COVID infections and 154,471 deaths as of August 3rd, 2020.

Texas has a history of ignoring the importance of maintaining robust, reliable, and sustainable funding for public health activities. Public health is responsible for epidemiologic disease detection and investigation, immunization, vaccination, disease prevention, public health laboratories and other population health services. The Institute of Medicine's, now known as the National Academy of Medicine, Committee on Public Health Strategies to Improve Health, concluded in 2012 that in order to improve physical and environmental health data collection, reporting, and action that the laws and policy need improvement and are inadequate. The Committee found issues with insufficient funding for public health and dysfunction in how public health infrastructure is funded, organized and equipped to use its funding. In short, the nation does not invest sufficiently in public health and that funding for governmental public health is inadequate, unstable, and unsustainable in light of its responsibilities and the expectations of the public.

Public Health Infrastructure



Public Health Infrastructure

The CDC's Public Health Emergency Preparedness (PHEP) cooperative agreement is the main source of federal support for state and local public health emergency preparedness and response. From FY 2003-19, the CDC's funding for state and local preparedness was cut by a third despite population growth and persistent threats. There is evidence of historical instability in public health funding from state and national lawmakers. There is an absence of a long-term commitment by policy makers to provide sustainable public health funding. State and national policy maker's commitment to public health funding is uneven and fluctuates with major health threats of the moment, political winds, and economic realities. History shows we mobilize episodically in response to threats then let our guard down when the threat subsides. Inadequate funding leaves public health departments poorly equipped to prevent, detect, and control disease outbreaks. Funding comes from separate appropriation processes at the local, state and federal levels with little coordination and each funder has their own priorities. There are three principle challenges: inadequate funding, compartmentalized, inflexible funding, and uncoordinated funding with varied rules for use.

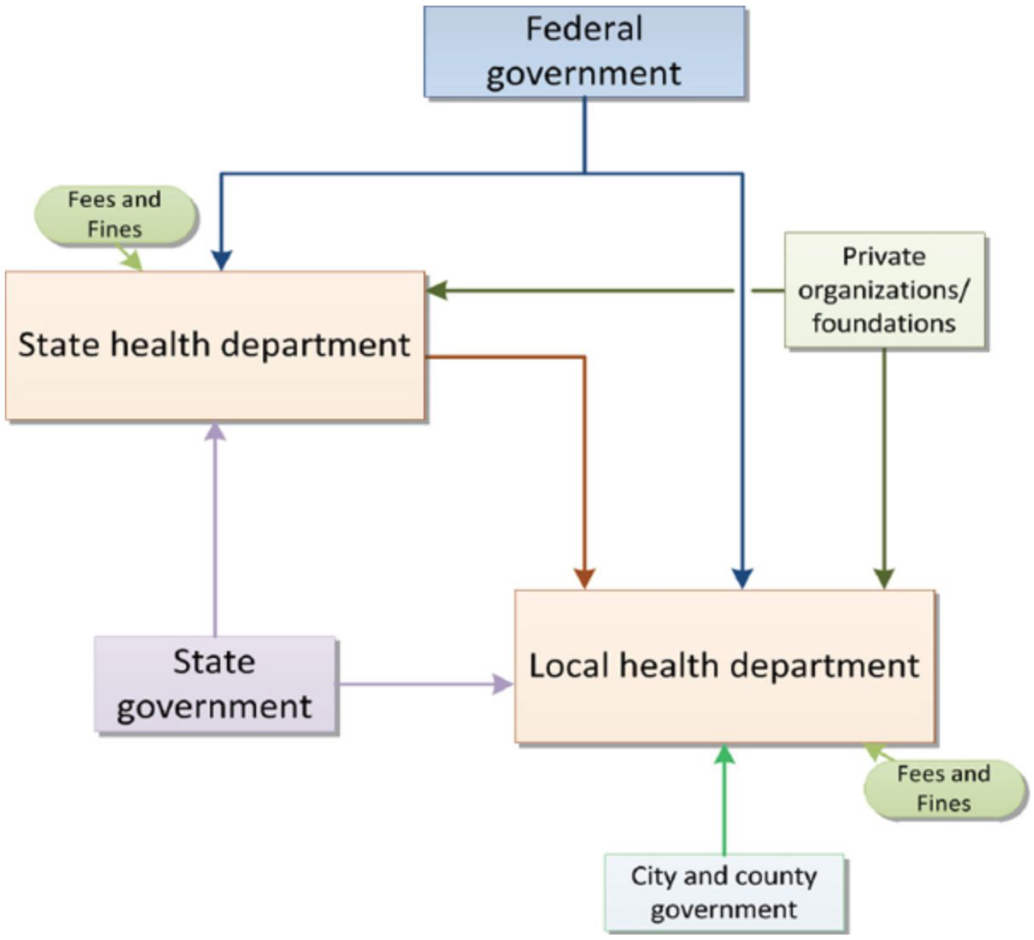


FIGURE 2-1 Public health funding flows.

The lack of reliable funding reduces the ability of public health departments to prevent disease, promote health, and protect the health of their communities in the face of a variety of threats. In the last 6 years, we have faced Ebola, Zika and Chikungunya viruses and a resurgence of Sexually Transmitted Disease (STDs), including syphilis. All the while, the burden of chronic conditions such as obesity is increasing in Texas which increases the risk of death in pandemics like COVID-19.

Public Health Infrastructure

Recommendation 7: **In times of public health emergencies, activate an incident command system to stand up a communications and collaboration infrastructure capable of informing the public, addressing dis- and mis-information, and communicating with the field, and that can provide for coordination within/between health departments, clinical care systems, social services, schools and businesses.**

From the onset of a public health crisis, public health authorities are expected to provide the general public with timely, accurate information and answers about its impact. News media are among the critical channels to inform and educate the public. When public health officials manage health crisis risk communication, they are helping community members know what to do and how to cope with both physical and mental health impacts. Public health is expected to use medical, epidemiological, behavioral, and statistical knowledge and good data and synthesize it all into useful information converted into messages and readily understandable and actionable concepts. Public health communications operate on the principles of transparency, reliability, and trust.

Communication management challenges have increased in the age of social media. With the addition of news from credible sources, the public is also exposed to misinformation and disinformation. Misinformation stems from our knowledge gaps, speculation based on less than full factual analysis. Disinformation is spread when social media channels are used to sow seeds of distrust or advance rumors. During a health crisis or any disaster, utilization of media sources increases. Internet usage following the September 11th attacks increased from 6 million to 12 million people visiting online news sites each day. Internet and media communications are not peer reviewed, and this may result in the dissemination of inaccurate information. Approximately 4 in 10 U.S. residents receive their news from online sources and 6 in 10 receive their news from social media.

Public Health Infrastructure

A health crisis highlights the importance of a systematic approach to assure effective collaboration and strong communications. The CDC developed a set of actionable recommendations, Crisis and Emergency Risk Communications (CERC), that should be considered as a guideline for effective communications during a crisis. The right communications help create a sense of order and understanding during a public health crisis. Practicing the CERC principles in your communications before and during a crisis can prevent harmful behaviors. We intuitively understand that poor communications can fuel chaos, add uncertainty, elicit a negative public response and result in poor outcomes. Proper planning, coordination, research, and training can improve communications. The focus in a crisis is to prevent illness, death and injury and return life to normal as soon as possible.

The importance of collaboration, especially during a crisis cannot be overstated. Even during normal operations, collaborating and coordinating can reduce inefficiencies in the larger health and health care system, result in improved responses to public health crises, and increase the support for public health. By creating and maintaining robust collaborative organizational structures in public health, with health providers and health care organizations, as well as social services, schools and businesses we improve our ability to exchange information and optimize real time solutions for our communities. As we work toward improving collaboration we should remember that the definition of public health is broad, encompassing the prevention of epidemics and disease, protection against environmental hazards, prevention of injuries, promotion of healthy behaviors and mental health, disaster and recovery assistance for communities, and provision of accessible and quality health services.

The third of the 10 Essential Public Health Services is to “inform, educate, and empower people about health issues.” Emphasis on accessibility of resources to serve the culturally and linguistically diverse population is essential.

Public Health Infrastructure

A report on community outreach and education organized by the Robert Wood Johnson Foundations addresses how to talk about social determinants of health in a manner that is accessible and acceptable by a larger audience. The report focuses on conveying the concept of the social determinants of health in more receivable language particularly for voters and policy decision makers. Conscious use of language is necessary for communities and stakeholders to understand that health starts well before the doctor's office; it starts where we live and work. According to the report, effective communication incorporates common vernacular, a narrative and emotional appeal, and a driving fact, but not overly data ridden. A common communication infrastructure would embrace these techniques to help effectively educate the public, address misinformation, and provide coordination on all aspects of health, not just those related to the doctor's office.

Recommendation 8: **Address local and regional variation of PH authorities in urban and rural areas by creating a quasi-governmental Council of Government (COG) type of multi-county resource pooling for data, services and programs and increase the number of accredited health departments including DSHS and not yet accredited local health departments.**

In addition to being the state's public health agency, DSHS divides Texas into public health regions that are supported by DSHS through the Division for Regional and Local Health Operations. Each regional unit provides essential public health services, supports local public health agencies and provides leadership and coordination for public health emergency preparedness and response. Each region has a regional medical director and/or a regional deputy director, employed by DSHS.

The Public Health Accreditation Board (PHAB) is a national organization that accredits state and local health departments in the US in order to "improve and protect the health of the public by advancing and transforming the quality and performance of governmental public health agencies in the U.S. and abroad." DSHS is not accredited and is one of 16 states whose public health agency is not accredited. Texas has 7 accredited local health departments which include Austin Public Health, Dallas County Health and Human Services, Harris County Public Health, Houston Health Dept., San Antonio Metropolitan Health District, Tarrant County Public Health, and Williamson County and Cities Health District.

The DSHS regional organizational construct helps place state-managed public health services closer to where they are needed and helps to complement the resources and capacity of local health departments across the state.

Ancillary to Public Health

Recommendation 9: **Prepare for the future health related resource needs of Texans. For example, resources needed in mental health, post-covid19 complications, avoided care.**

> *"Our response to the COVID-19 pandemic involved the suspension of many state laws and regulations so our access to medical care, prescriptions, food, rental and utility support could be made readily available in this time of crisis. It is important that we use these valuable lessons and experiences to review our current laws and processes. We should seriously consider moving forward in retaining those changes that proved to be successful in responding to this pandemic!"*
>
> *Jaime Weso ł owski, President & CEO, Methodist Foundation*

COVID-19 is a grey swan event, a highly probable event that is predictable and carries an impact that can easily cascade. The convergence of a pandemic that would disproportionately impact vulnerable segments of a population and its impact was predictable.

A clear pattern has emerged. In addition to persons age 65 and older and persons with some underlying medical conditions being at higher risk of severe or fatal COVID-19, Black Americans, Latino/Hispanic persons, and indigenous Americans and the poor are being disproportionately adversely affected by COVID-19 in terms of cases, hospitalizations, and deaths. Before COVID-19, persons with lower educational attainment, lower household income, and no health insurance experienced worse health outcomes, had higher prevalence of disease risk factors and struggled more to access the health system than persons who were better educated, had higher income, had more wealth, and had a higher likelihood of having health insurance. COVID-19 has highlighted the impact of those differences.

These health inequities are driven in large measure by public policies. Health is influenced by a range of social, environmental, and economic factors: educational attainment (which is affected by quality of education), health insurance status, affordability and quality and location of housing, food, and quality of medical care. Until we appropriately and equitably invest in these health equity pillars, health disparities will persist, and our society and economy cannot thrive.

> *"COVID-19 has put a finer point on the historical inequities that are pervasive in our country and throughout Texas' most vulnerable communities – including vast differences in health status, health access and the distribution of health resources based on age, race, gender or geography. The heavy and difficult days faced by our community have served as an awakening for some, and a reminder for others, of the health inequity all around us. We must work together—state and local governments with municipalities and non-profit and for-profit organizations—to inspire real change. Let's seize this historic moment today and commitment to a better tomorrow."*
>
> *Edward B. Burger, Ph.D., President and CEO, St. David's Foundation*

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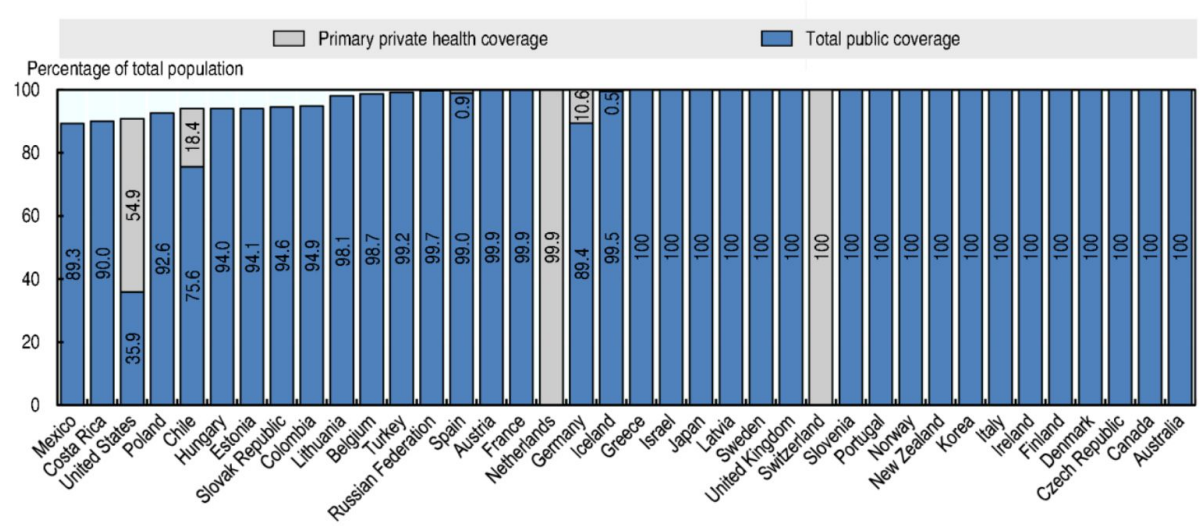
Public health experts say focusing on these disparities is crucial for helping communities respond to the virus effectively — so everyone is safer. "I think it's incumbent on all of us to realize that the health of all of us depends on the health of each of us," says Dr. Alicia Fernandez.

Figure 3. Population coverage for a core set of services, 2017 (or nearest year)



Source: OECD Health Statistics 2019, https://doi.org/10.1787/health-data-en.

Ancillary to Public Health

As we “stay at home”, social distance, set up home office environments, and manage our children’s education, we struggle. Experts say many of us are experiencing high anxiety, increased frustration, and loneliness. The ‘fall out’ from this will be seen in increased demand for mental health (MH) services with some estimating as much as a 100% increase. Nationally the ‘expressed need’ (defined as the need acted upon) for current MH services is 12 %. Following the crisis that may double to 24 %. Studies show that MH services were insufficient before the pandemic; 53 million Americans (21%) wanted to see a mental health professional but were unable to do so in 2017.

The COVID-19 pandemic has resulted in millions of cases of COVID-19, millions of persons losing their jobs and health insurance, and millions of people being forced to or choosing to forgo ongoing clinical care for underlying medical conditions. Among those who survive COVID-19, some may have lingering sequelae, a condition which is the consequence of a previous disease and needs ongoing chronic disease care. The public health and epidemiologic consequences are not clear but should be anticipated and planned for.

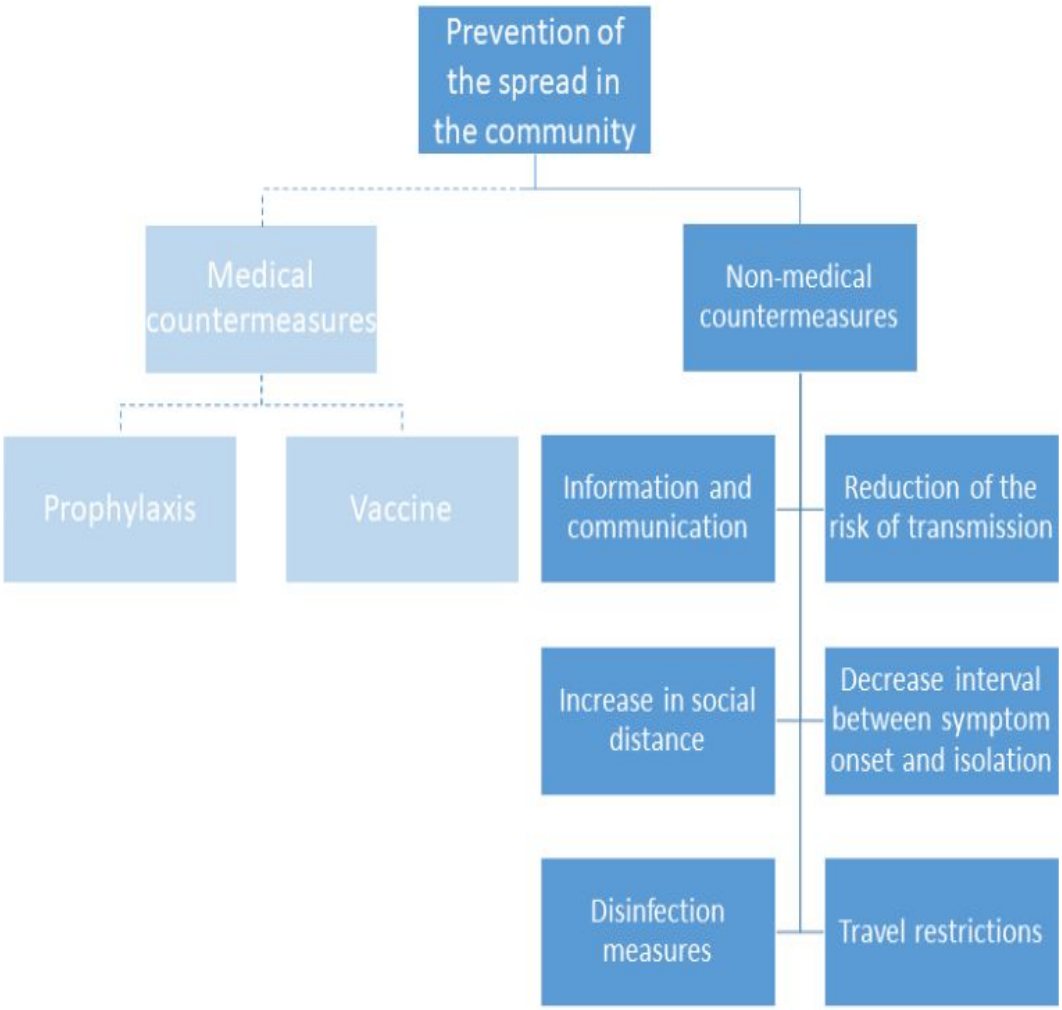
Ancillary to Public Health

"The single most influential action Texas could take for significant progress across all three sections of these recommendations is to enable all Texans to carry health insurance. Covered Texans maintain personal responsibility for their own wellness and contribute to our ability to detect, prevent, respond and recover from a public health crisis. Texas could achieve a simple coverage matrix by implementing currently available federal Medicaid and coverage waiver opportunities, establishing its own state-based health insurance exchange, and enacting savings incentives for businesses to offer more coverage choices. When Texans carry health insurance, they help fund the workforce, contribute crucial health statistics for surveillance, and strengthen our public health infrastructure."

Catherine Mitchell, M.S., EVP and Chief Operations Officer, Community Health Choice

These are challenging times for municipalities, counties, states and the nation and the world but the value of population-based health interventions and the need for vibrant public health enterprises is an imperative. In many respects we should consider a system redesign.

The DSHS supports city and county health departments and serves an important role in collaboration, fostering the growth of healthy communities resulting in greater prosperity. One important component to fostering healthier communities is taking time to improve health literacy. Our Advisory members suggest building curriculum in public schools for things like 'germ spread theory' for example.



Main public health policy responses to epidemics, including COVID-10 pandemic

Ancillary to Public Health

Recommendation 10: **Build the system that can "know" in real time the health status of individuals to enable appropriate mobilization of health and health care resources.**

> *"I would like to echo Dr. Cigarroa's statement; 'It is critical to the future health of Texas that we appropriately invest in public health to help prevent disease and to be able to respond swiftly and accurately to a public health crisis whether it be a pandemic or not. This requires a public health surge capacity, innovative ways of educating more public health professionals and the appropriate Information Technology infrastructure to be able to acquire reliable data, metrics and enhance communication among Departments of Public Health.'"*
>
> *Greg Hartman, Texas A&M University, Chief Operating Officer & Senior Vice President | Health Science Center, Vice Chancellor | Texas A&M University System*

At the local, state, and national level, the degree of collaboration between health care facilities and public health agencies can impact a country's public health preparedness, capacity, and response to a public health crisis. The gaps that are present in our public health infrastructure are consequences of the current state of health information exchange and interoperability in the U.S. As we have seen with COVID-19, the spread of a communicable disease can create disarray in our public health system. That is why it is important to advance the use of health information and technology. The application of health information and technology, by way of a unique patient identifier (UPI), can be a valuable asset to the delivery of public health services in times of crisis.

Comparing UPI to the Current Patient Matching System

A unique patient identifier (UPI) would be to healthcare what a social security number is to finance. UPI is a tool designed for health care providers to use to identify and confirm an individual's identity without need for demographic information that is subjected to change over the course of an individual's lifetime.

Most developed countries use their own variation of UPI based on their healthcare and public health needs. Some forms of UPI include the use of an assigned UPI number (a string of numbers and/or letters), a UPI smart card, a biometric identifier, or a UPI that is linked to the country's civil registration system.

Unique patient identifiers are a stark contrast from the current patient matching system in the United States. Patient matching relies exclusively on demographic information to match patients to their existing medical records, if any. A medical record number is assigned to every patient visit, but it is specific to each individual healthcare facility in the U.S. The medical record number is stored in a health system's Master Patient Index, which is the electronic database that contains patients' health information. Consequently, the patient's medical history is not transferable across multiple health care facilities.

The Importance of UPI in a Public Health Crisis and for Improving the Quality of Healthcare

During a public health crisis it is important to have access to real-time data, enabling faster response times and decision-making by public health experts. The lack of data interoperability amongst our current electronic health record systems, which contain and safeguard patient health records, is the biggest barrier to obtaining accurate and timely data. With the added step of creating a national database for the consolidation of public health data, a unique patient identifier would enable health information exchange across different institutions on a state and national level.

Additionally, patient matching errors have impacted the health care and public health systems at large. These errors are only exacerbated during a public health crisis, such as COVID-19. According to the Emergency Care Research Institute (ECRI), patient misidentification is amongst the top ten threats to patient safety.

Patient safety is jeopardized when a patient's identity is not accurately matched to their medical records, resulting in delayed or lost diagnoses, duplicate testing, wrong patient orders, and inaccuracies within a patient's longitudinal medical history. According to Johns Hopkins University, it is estimated that more than 250,000 people in the United States die each year from medical mistakes, some of which are attributed to physicians operating on incorrect patient data. As mentioned in the article "Covid-19—implications for the health care system" published in The New England Journal of Medicine:

> "Tellingly, there is no national public health information system — electronic or otherwise — that enables authorities to identify regional variation in the demand for, and supply of, resources critical to managing Covid-19. Without such information, authorities have no way to direct vital resources from areas of surplus to areas of undersupply. It is no exaggeration to say that the United States currently lacks a functioning national system for responding to pandemics."

During the COVID-19 pandemic, a number of nurses have reported instances of using the internet as a last resort to gain information pertinent to matching patients with their test results. In addition, the insufficient collection of patient data at COVID-19 testing sites have caused a backlog of COVID-19 test results in laboratories and in some instances, results were even sent to the wrong patient. A unique patient identifier offers a solution to the drawbacks of the current patient matching system, but its benefits are even more so exemplified in a public health crisis such as COVID-19.

The Benefits of UPI for Disease Detection and Investigation

As stated earlier, the current patient matching system based on demographic data alone, is a large barrier to matching patients with their respective test results. Contact tracing, a key strategy to the containment of disease outbreaks, is dependent on the quality of information provided by public health agencies and healthcare facilities. A UPI can act as an invaluable tool in the communication of information between public health authorities and medical experts during a public health crisis.

Access to real-time data allows public health authorities to implement basic disease-control measures. In terms of preparation, reliable and timely data can aid in the allocation of medical resources throughout the country for an anticipated crisis. Extensive testing and accurate patient identification are essential to knowing the epidemiology of a disease, which includes how widespread a disease is, the rate at which people are being hospitalized or dying, and how these factors evolve over time. Moreover, a UPI would facilitate the coordination of large-scale immunization programs, including those for COVID-19. As quoted in the article "How De-Identified Patient Data Access Fuels COVID-19 Research" written by Christopher Jason:

> "The first challenge that many researchers have run into with this crisis is the difficulty of accessing high-quality health data that can be used to answer pressing questions such as drug and non-drug treatment effects, factors that drive differential risk of catching the disease and very different outcomes in those who do," said Mark Cullen, MD, professor of medicine at Stanford University and the head of the COVID-19 Research Database Scientific Steering Committee.

Ancillary to Public Health

Evidence-based research is the foundation of public health, yet many researchers have faced difficulty accessing high-quality data to conduct their COVID-19 studies. This research is essential to advancing our understanding of COVID-19, which include determining the best standards of care for COVID-19 patients, vaccine effectiveness, drug treatment options, etc. A UPI will enable researchers to have access to data across multiple healthcare facilities, aiding in the effort to analyze the long-term health effects of COVID-19. Overall, the lessons learned from this pandemic will serve to better prepare our public health system with its response to future public health crises.

Modern Reception to UPI

A 2018 study conducted by the Pew Research Center informed participants of the safety issues and costs associated with poor patient matching among electronic health record systems (EHRs). As a result, the Pew Research Center found that participants “overwhelmingly” supported the implementation of a unique patient identifier to improve patient matching and the EHRs. Participants viewed using biometrics as a more secure option than the traditional patient matching system that uses demographic data. The group’s preference toward biometrics was attributed to their level of familiarity and comfortability with fingerprint scans that are widely used in smartphones and airport security. During the COVID-19 pandemic, biometrics remained as the first-choice option of UPI among 54% of Americans in another Pew study conducted in the summer of 2020.

Listed below are some of the different ways being considered that would more accurately match up a patient's electronic health records across multiple health care providers. For each one, please indicate how comfortable you would be with your health care provider using it to match up your electronic health records across multiple health care providers.

	Very comfortable	Total comfortable (sum of very and somewhat comfortable)	Total not comfortable (sum of very and somewhat uncomfortable)
Fingerprint scan	32%	65%	34%
Unique number or code	27%	66%	33%
Smartphone or app	22%	53%	46%
Eye scan	21%	51%	47%
Facial photos	18%	53%	46%

https://www.pewtrusts.org/en/research-and-analysis/articles/2020/09/16/americans-want-federal-government-to-make-sharing-electronic-health-data-easier

Similarly, the 2020 Pew Research study demonstrated that 81% of Americans support efforts to improve how their medical information is exchanged among health care providers, and 61% want greater access to their own health data. In terms of funding, about two-thirds of respondents, including majorities of Democrats and Republicans, said that the government should be allowed to allocate money toward improved patient matching. From these results alone, it is evident that a majority of Americans are in favor of improving the current health information exchange system.

Likewise, many respondents in the study expressed support toward several UPI methods that improve the accuracy of their medical records. Overall, both research studies prove that Americans recognize the importance of improving EHRs and patient matching by implementing a unique patient identifier into the healthcare system.

Do you think that the federal government should or should not be allowed to spend money on the development of new ways for health care providers to more accurately match up a patient's electronic health records across multiple health care providers? (Do you feel that way strongly or not-so-strongly?)

Strongly should	Not-so-strongly should	Not-so-strongly should not	Strongly should not	Total should	Total should not	Don't know	Refused/skipped
34%	33%	14%	16%	67%	30%	1%	2%

https://www.pewtrusts.org/en/research-and-analysis/articles/2020/09/16/americans-want-federal-government-to-make-sharing-electronic-health-data-easier

The History of UPI in the U.S. and its Feasibility

In 2009, the United States federal government passed the Health Information Technology for Economic and Clinical Health (HITECH) Act, which encouraged the adoption of an electronic health records system (EHR) by hospitals and providers using an incentive program.

Ancillary to Public Health

The purpose of an EHR system is to collect and store health information on patients over time, facilitating immediate electronic access to individual and population-level information. This allows public health officials to make important decisions based on accessible data. Today, it is estimated that 93% of Texas hospitals adopted certified EHRs. Although this is a major accomplishment, a major downfall to the HITECH Act is the lack of enforced interoperability between the many different electronic health record systems that are used by hospitals and physician practices.

With an EHRs framework already in place, it is plausible to consider the implementation of a unique patient identifier to solve the problems of the current patient matching system. Most importantly, a UPI facilitates the interoperability of EHRs, which enables crucial access to the data that informs public health decisions in emergencies or crises. Moreover, the Health Insurance Portability and Accountability Act (HIPAA) of 1996 required the U.S. Department of Health and Human Services to issue every citizen a UPI. In 1998, public outcry on the privacy concerns of UPI prompted Congress to prohibit federal funding toward UPI.

For over two decades, section 510 of the Labor, Health and Human Services, Education and Related Agencies (Labor-HHS) appropriations bill within the federal budget has been the biggest barrier between the adoption of a UPI nationally. It did not, however, stop government agencies or state governments from adopting UPI on a local level. For instance, the Department of Veterans Affairs and Department of Defense both utilize their own form of UPI among their hospital systems. In addition, Medicare uses the SSN as their form of unique patient identifier. Lastly, Minnesota and Nevada have adopted state legislation for UPI but have yet to fund its implementation.

Throughout the past two decades, adoption of a national UPI has garnered increasing support among various stakeholders such as the American College of Physicians (ACP), American Health Information Management Association (AHIMA), and the HIMSS Electronic Health Record Association. Removing the federal appropriations ban on UPI would assist the healthcare system in the US to deliver high value, cost-effective, and patient-centered care.

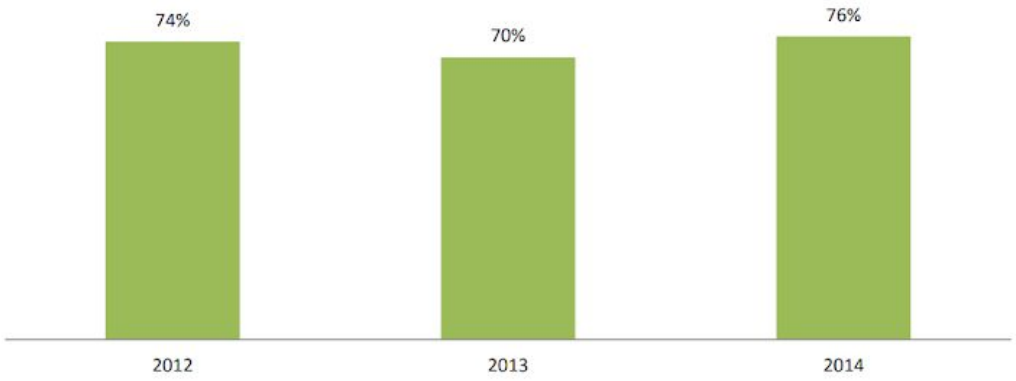
Addressing the Challenges of UPI

According to a study published by the RAND corporation, the cost estimate for the implementation of a unique patient identifier would be approximately between $3.9 to $9.2 billion. However, many experts note that little progress has been made in the development process for a UPI, resulting in unconfirmed estimates. Allocating funds towards investigating the cost of UPI implementation would provide more clarity on the appropriate UPI to use on both the state and national level.

As stated previously, public reception towards a UPI has become favorable in recent years. In addition, the American public has changed their perspective on the use of electronic health records data for the purpose of clinical and public health research. According to a study published in the Journal of the American Medical Association, only 3.7% of individuals say they are not comfortable with sharing their data for research, and 72.9% say they would be willing to share their data selectively. In other words, a majority of respondents would give general consent to the use of their medical records for research.

Between 2012 and 2014, at least 7 in 10 individuals have supported electronically exchanging their health records despite potential privacy or security concerns.

Figure 6: Trends in individuals support for electronic health information exchange (HIE) in spite of privacy and security concerns, 2012-2014.



NOTE: No significant differences between years ($p<0.05$). This graphic reports on the proportion of individuals who strongly agree or agree with statement (See appendix for related survey questions).
SOURCE: 2012-2014 Consumer Survey of Attitudes Toward the Privacy and Security Aspects of Electronic Health Records and Health Information Exchange

https://www.healthit.gov/sites/default/files/briefs/privacy-and-security-trends-data-brief-21616.pdf

An article published in the Journal of the American Medical Informatics Association recognized the use of de-identified data and minimal data elements as one of the ten patient data sharing principles that address conflicting patient data sharing messages and privacy concerns. A few of the other principles mentioned in this article include avoiding financial compensation for data sharing, providing transparency with stakeholders, and developing a data sharing review committee. With these guiding principles and strong data protection laws and enforcement, the implementation of a unique patient identifier would improve patient care, research, and innovation while protecting an individual's privacy. As mentioned in the article "How De-Identified Patient Data Access Fuels COVID-19 Research" written by Christopher Jason:

Ancillary to Public Health

> "If the UPI were to facilitate the development of a more efficient national network, any potential negative effects of such a network could be ameliorated directly through other aspects of systems architecture, such as encryption, access controls, and audit trials," Rand Corporation reports. "And use of a UPI would actually improve privacy by limiting the transmission of more sensitive identifiers, such as combination of names, address, date of birth, and Social Security numbers."

UPI Application in Other Countries During a Public Health Crisis

According to the Disease Control Priorities Project report, the global pandemic outbreaks of the past, such as the 2003 severe acute respiratory syndrome (SARS) and the 2009 influenza A (H1N1), were contained through the application of rapid disease outbreak investigation and response network systems. Countries that invested in their public health infrastructure include Taiwan and South Korea, both of which adopted a unique patient identifier.

The residents of Taiwan carry a unique National Health Insurance (NHI) smart card as their form of UPI. Once a doctor swipes the chip-encrypted smart card, they have access to the protected health information stored on the card, including diagnosed health conditions, allergies, drug prescriptions, insurance data, immunization records, etc. Taiwan was well-prepared for public health crises by using UPI to identify and track SARS amongst their population. Health care providers were required to report each patient visit and service delivered to the NHI Administration, which allowed for the rapid tracking of individual and population health.

Ancillary to Public Health

Similar to Taiwan, South Korea also benefited from the use of a UPI during previous pandemics, but their UPI came in the form of an existing identifier that is similar to an American social security number. To contain and limit the spread of contagious diseases, health care facilities and public health agencies were required by law to report the information of infected individuals to the government.

It is worth noting that South Korea's UPI has also provided its government the ability to identify low-income individuals that have limited access to health care. As a result, vulnerable populations have been extended health coverage through various government assistance programs. For instance, the UPI has facilitated public aid services like that of a meal aid program for undernourished children and supplemental nutritional aid to infants and pregnant mothers. As quoted in the article "Coronavirus Is Exposing All of the Weaknesses in the US Health System" written by Dylan Scott:

> "The U.S. performs worse than average among similarly large and wealthy countries across nearly all measures of preparedness for a pandemic," said Cynthia Cox, director of the Peterson-Kaiser Health System Tracker. "The coronavirus outbreak is already exposing inefficiencies and inequities in our health system, and it is likely to put much more strain on the system in the coming weeks."

The Future of UPI

The implementation of a unique patient identifier on a national level would open the door for other public health functions that are currently in need of improvement or are underutilized in the United States. For instance, the U.S. does not have a national public health information system (i.e. database) where important data is aggregated and analyzed for decision-making.

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A national public health information system would connect state and local public health departments seamlessly, facilitating the application of a UPI during disease outbreak investigations. Such a system would have enabled public health authorities to identify regional variation in the demand for, and supply of, resources critical to managing COVID-19 and its affected patients.

The exchange and analysis of non-medical data has been important to the successful management of COVID-19 in other countries. For instance, Taiwan has merged the travel history of its citizens with their medical data, which are readily accessible to health care providers. Another advantage to this application of UPI involves the government's ability to alert local health care providers about a possible influx of infected people based on its citizens' travel history. During the pandemic, Taiwan utilized its UPI system to monitor individuals under quarantine through use of their mobile phone data to precisely track the location of patients that test positive for the coronavirus. This has all been possible due to Taiwan's implementation of a UPI. The use of UPI allowed Taiwan to effectively prioritize containment efforts of COVID-19.

Conclusion

Investing in a robust public health information system starts with the implementation of a unique patient identifier. The growing need for data interoperability between healthcare facilities and public health agencies is evident through the COVID-19 pandemic. Lacking access to real-time data has slowed down research efforts and the capacity for which public health agencies can relay timely, accurate information to the general public. The implementation of a UPI can make a difference in managing public health during normal times and those of crisis.

Ancillary to Public Health

Recommendation 11: **Create an electronic passport/health record for epidemiological purposes**

> *"If we learn anything from the COVID-19 crisis is the need to take a dramatically different approach to preparing for a wide variety of public health crises. We're lucky that the virulence of the virus, in its current manifestation, is not more lethal nor more easily spread. The next epidemic or iteration of COVID-19 may be much worse and that is the scenario we must be prepared to confront."*
>
> *Don Hall, M.P.H., Principal, Delta Sigma, LLC*

An electronic passport 'e-passport' is a digital passport similar to a printed passport. This digital technology is helpful to public health authorities. Electronic passports can contain immunization records, travel records, and biological identification; name, social security, birth, and photo of a citizen. Digitized data enables a touchless system, minimizing contact and exposure to disease agents at points of entry; airports, and mass transit systems. This policy paper supports our recommendation to create an electronic passport to support disease detection and investigation for epidemiological purposes. Electronic passports provide readily accessible data relevant to disease tracking, travel restrictions and containment. They may include fingerprints, facial patterns, a photograph, date of birth, and other important information that is used to identify a person. E-passports facilitate travel by allowing automated identity verification, faster immigration inspections, and greater border protection and security.

The United States now requires travelers entering the country under the Visa Waiver Program to have an e-passport if their passport was issued after October 26, 2006. The United States and its VWP partners are working to identify a technology that would support the production of e-passports and readers as an effort to enhance security and ease travel.

Ancillary to Public Health

There is much to improve in the current system as more aspects of identification could be added to benefit public health, such as health and vaccination records that assist in the tracking and assessment of disease spread. In addition to making travelling safer and easier, this technology can also be utilized in the fight against the spread of infectious diseases by incorporating travel histories, health data, and immunization records digitally.

Nations may permanently require visitors to demonstrate vaccination history before entry. This is not a new concept in the United States, immigrants are currently screened for TB, Polio, measles, and HIV. E-passports offer an additional benefit as a touchless system that is attractive in a world where people need to maintain social distance. Similar to contact tracing, e-passports could work as a checkpoint for disease monitoring and tracking. It may become useful to track the entry and exit of citizens within regional and national borders. A digitized passport has many advantages to public health investigation and management.

Security Issues with Electronic Passports

With all technology there is always the chance that security issues may arise. The United States (U.S.) mandated the adoption of biometric passports by the twenty-seven nations that were included in the Visa-Waiver Program (VWP). By the end of 2005, all passports distributed by the U.S. are to carry biometric information, and they will follow guidelines set in place during the International Civil Aviation Organization (ICAO), overseen by the United Nations. One ICAO standard includes facial recognition requiring e-passports to contain images of the face of the owner.

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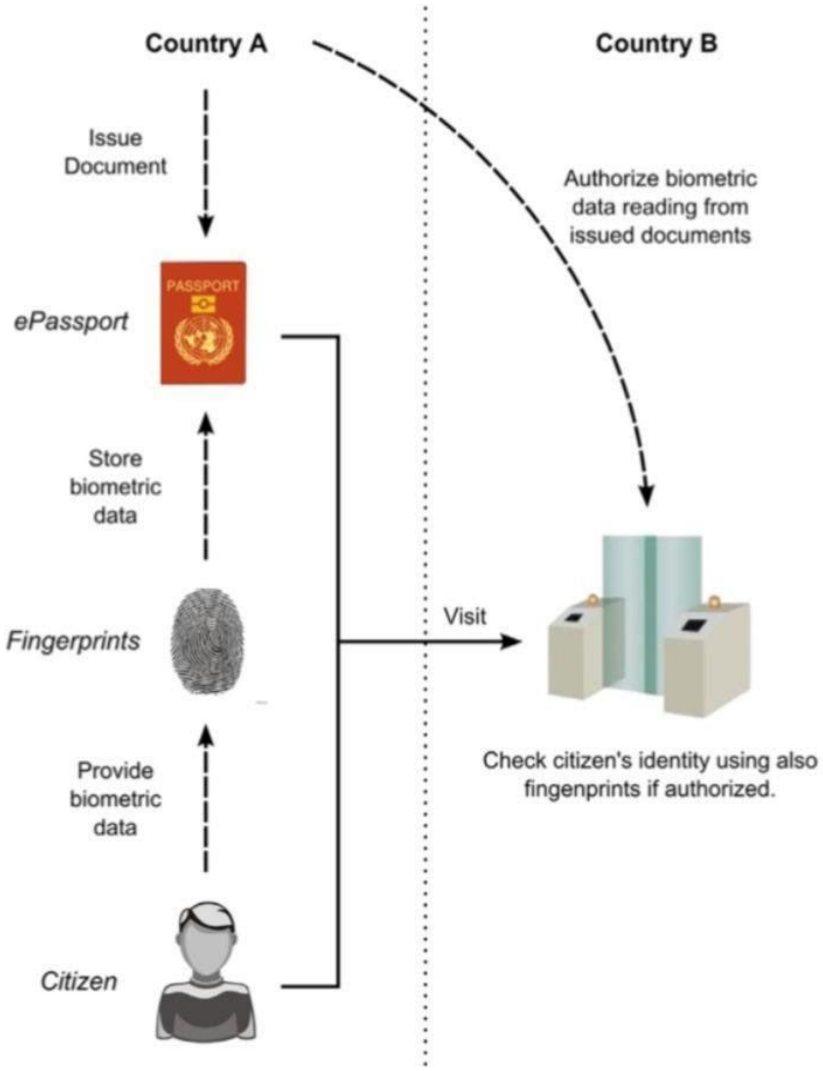
ICAO standards include fingerprints and iris data as an optional biometric form of identification. The goal of ICAO is to create a process of strong authentication in which people are verified with precision and accuracy that is unmatched and irrefutable. Therefore, data integrity is of extreme importance as when authorities work to establish identities the information they receive from e-passport users must be valid and guaranteed to lack tampering, forgery or other falsifications. However, this is not the only aspect of strong authentication that would be necessary, as data confidentiality would also need to be addressed and protected. Data confidentiality is essentially the secrecy of the data that would be stored in e-passports. Keeping personal data of e-passport holders safe is key as this protects against security threats such as forgery. We need to note that biometric passports are costly and a significant investment in public health would need to be made for them to be secure.

Citizens must be able to trust that their information will be safe. In order to roll out the next generation of e-passports, certain security threats must be addressed and the quality of data protection programs and supporting mechanisms of privacy must be constantly progressing and improving. Some threats to data security were identified in 2012 regarding Radio Frequency Identification (RFID). RFID tagged e-passports are vulnerable to clandestine scanning which can leak personal information such as date of birth and nationality. Connected to this is clandestin tracking which enables the passport holder's movement to be known to unauthorized parties. "Faraday cages" are a viable countermeasure to clandestine scanning and applied to e-passports they would be a metallic material that will encapsulate holders or covers to prevent the penetration of signal.

Data leakages are another serious threat as these could allow imposters to fake identities and get accepted into the system even as an invalid user. This is possible through “eavesdropping” a method that allows the imposter to copy a passport and duplicate it for their own use. However, solutions do exist and were explored in 2017 with the use of access keys that are generated each time the e-passport is scanned and authenticated at the reader. Also, digital signature certificates between the e-passport holder and server can be established and encrypted to avoid eavesdropping. Everything will be encrypted including the key requests by e-passport holders and the response of the server to this.

Another problem arises with the widespread use of e-passports is the perceived threat to privacy. Many individuals may see the collection and storage of data to be dangerous. This is not a new fear, as geotracking, big data collection and social media all contribute to concerns of usage and safety of personal information. The more control individuals have over personal information, the more willing they are to share it.

Electronic Passports and Traveling



E-passports can become essential here as case importations from other countries are carefully considered. With e-passports it would be possible to recognize who is entering and exiting the country at the onset of spread and the surge of a pandemic. While many countries implemented a plan in which they supplied a dedicated quarantine building for arriving travelers to keep them isolated during their infectious period, some countries did not.

Fortunately, e-passports could fill in this gap as countries may require travelers to quarantine independently; e-passports will allow for these travelers to be tracked and authorities notified if quartinie is broken. E-passports can limit travel on their own by containing health information that may make individuals unfit for travel. For example, an e-passport could contain information regarding COVID-19 testing results ,and if someone were to test positive for the virus their e-passport would indicate this and render them unable to travel. Moreover, e-passports could integrate health records and other online health services like patient portals.

Satisfaction of Electronic Passports in Other Countries

Many countries have begun to use electronic passports due to their usefulness in easier travel and because it is a more secure form of technology. The development and improvement of e-passports has led to greater satisfaction. European countries have found that breaches are easier to detect while using an electronic passport, allowing people to feel more secure and comfortable with the use of this technology. Similarly, Australia has also conducted surveys to see how satisfied people are with electronic passports and many have recommended it to others. They believe personal data on the microchip maintains an appropriate focus on protecting privacy. Most feedback given in these countries have been positive. These results provide measurable quantitative and qualitative security to the use of electronic passports for public health infrastructure.

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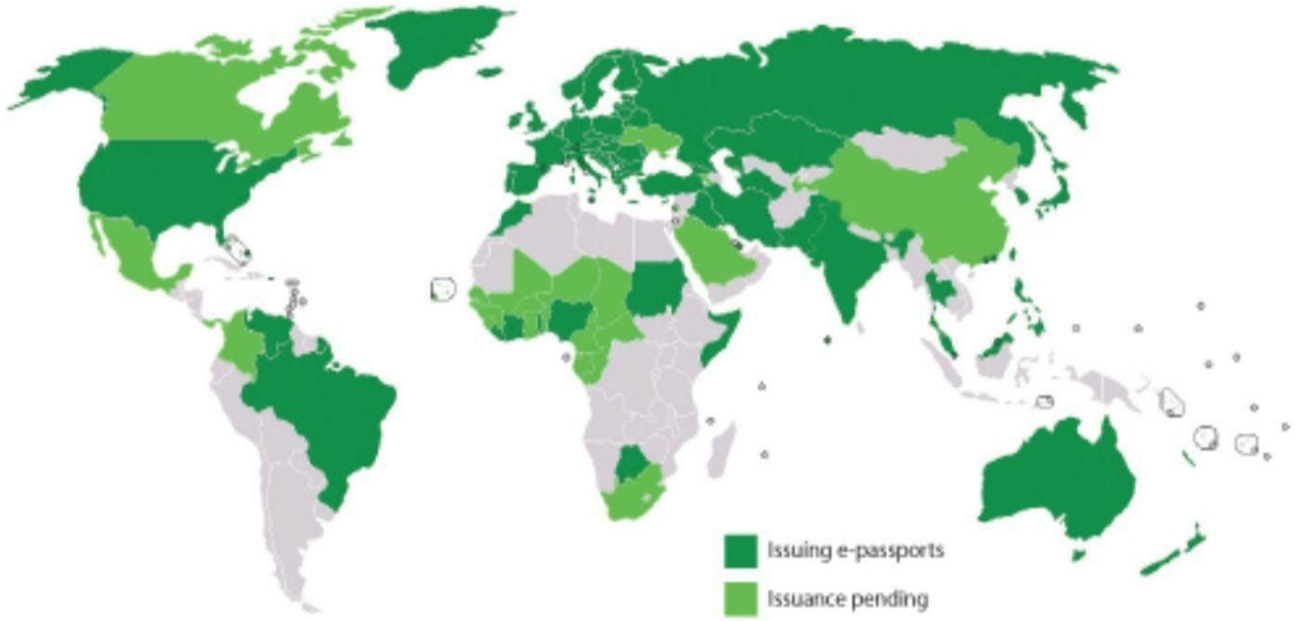
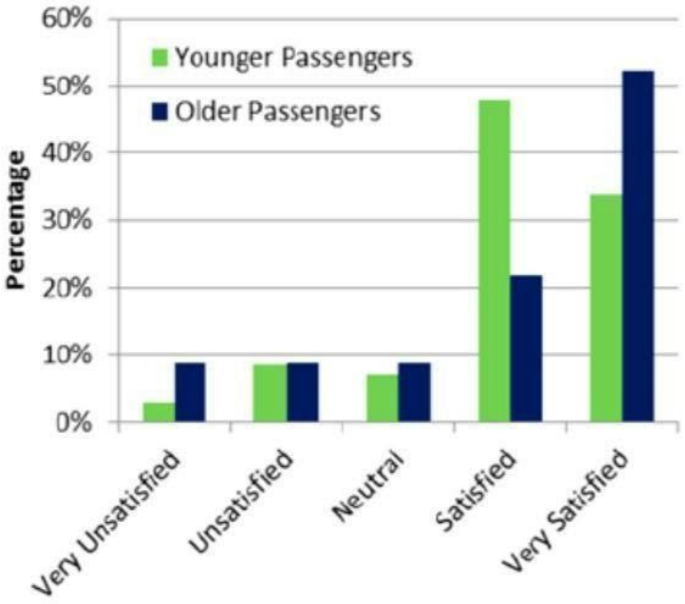
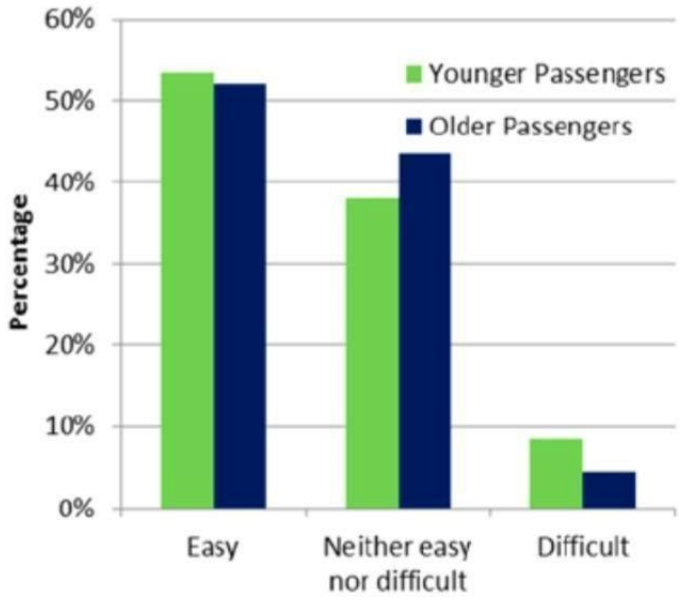


Countries currently using electronic passports include Andorra, Australia, Austria, Belgium, Brunei, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, San Marino, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, and the UK. As one can see, electronic passports have spread to more than half of the globe. Airports are now able to read these devices and more are ready to deploy the technology in the next couple of years. These countries should also consider using electronic passports for the use of health data for future pandemics.





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In Melbourne, Australia, electronic passports have had over 70% satisfaction amongst both younger and older generations. Australia has been using electronic passports for a while and has shown tremendous improvement of airports and traveling- especially during times like today. They consider e-passport implementation essential due to the increase in passenger demand and the constraints and limitations of the traditional process. Electronic passports had positive perceptions of low wait times, less direct contact, easy adaptability. Additionally, People have not had any problems when it comes to security or identity fraud since the use of the passports.

Moreover, India has found electronic passports to be more effective in strengthening security when traveling internationally. This has helped keep track of citizens when countries were undergoing lockdowns in the beginning of the COVID-19 pandemic. They found it necessary to roll out the manufacture of e-passports on a priority basis. Over the past couple of years of using this biometric device, there has been much improvement and satisfaction from their customers and citizens. Using electronic passports is a transparent and efficient delivery system that has benefited citizens. They have found the need to invest in thousands of more passports to ensure everyone gets one.

The Future of Electronic Passports

As projected, the electronic passport business will continue to grow and more countries will use them for travel, health records, and public health. The future of these biometric devices is looking bright for citizens all over the world- including developed countries like the United States. The global market of electronic passports was once valued at $11,752 million in 2016 and it is now projected to reach $57,061 million by 2023.

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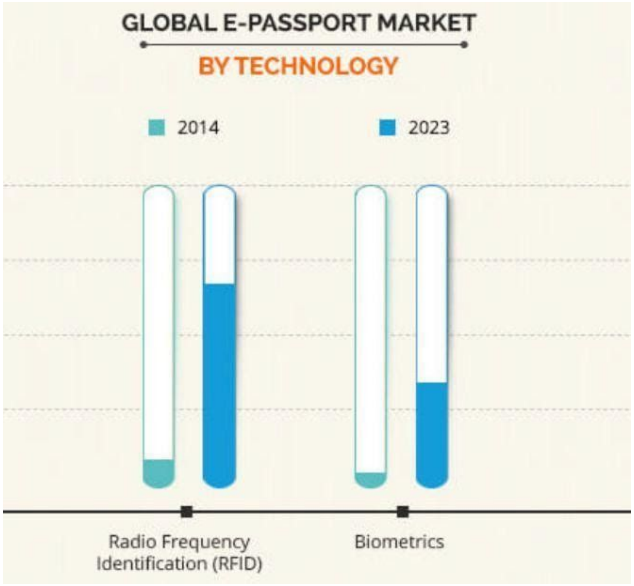
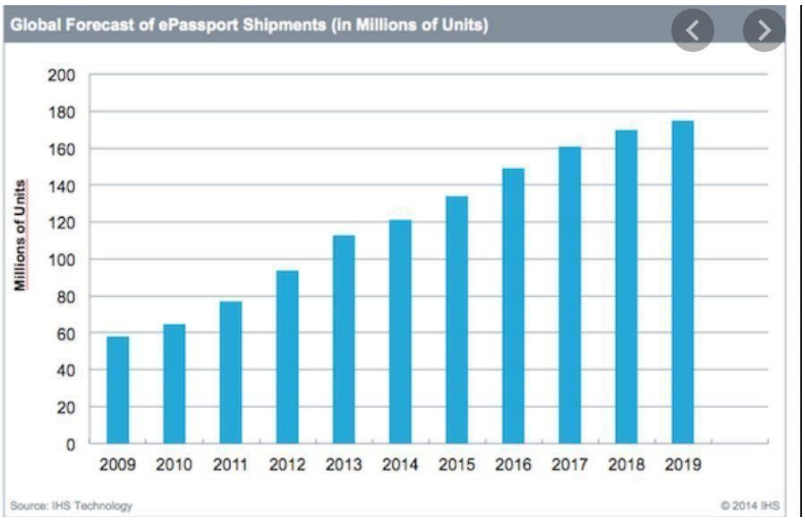
"E-passports provide faster security checks and verification of individuals at airports and international borders; and rise in adoption by many countries to enhance the safety of citizens, lower the rate of passport, and visa fraud boost the demand for e-passport markets." - Rachita Rake, Research Analyst at Allied Analytics LLP.





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Over 1,000 million e-passports are now in circulation and are emerging at a faster pace than anyone has ever imagined. In 2018 alone, there were about 264 million new electronic passports issued worldwide, some even in the United States. However, as this paper has proposed, e-passports should be used to explore the benefits of their usage in public health.These passports show no harm when it comes to taking people's civil liberties, instead, they are now being used to protect others more.

> "The implementation of the e-passport program is essential to homeland security."- Paul Rosenzweig- founder of Red Branch Consulting, James Carafano- director of the Douglas and Sarah Allison Center for Foreign Policy Studies and Vice President of the Kathryn and Shelby Cullom Davis Institute for International Studies at The Heritage Foundation, and Ha Nguyen.

Eventually, the United States, and countries around the world, will become more technology-based which will allow for the use of electronic passports. These passports will allow for the re-establishment of policies on international travel amidst pandemics. This can be seen when countries around the world implement travel restrictions, preventing the spread of disease. In future pandemics or epidemics, these passports will allow countries to control the spread of disease.

Conclusion

While e-passports can make travel safer and easier this technology can also be applied to the fight against the spread of infectious disease. It would be beneficial for e-passports to include complete travel histories, necessary health data, and immunization records.

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It will become more likely that countries will require visitors to provide proof of vaccination. The COVID-19 pandemic will not be the last of its kind, and so it will be essential to develop methods to properly handle these situations and technology will play a major role. This policy research strongly suggests that e-passport technology is a necessary tool in public health. Issues will arise as use of e-passports grows and while concerns exist with privacy and security of data however, there are ways to alleviate these worries as countries improve the system. Digital IDs through e-passports have proven useful in the screening, detection, and containment of contagions. Public health often relies on the ability to trace and contain contagions, and e-passports will provide the means to do so, as they will function as a checkpoint at the point of entry. It is vital to maintain records of people as they enter and exit countries to monitor infection and improve the ability to investigate, if necessary, the spread of disease. Findings prove that people overall are satisfied with technology such as e-passports and see its value.

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"The Public Health response to COVID 19 has been the challenge of a lifetime. This report highlights areas where we need to invest in the future. As COVID 19 has severely impacted those with chronic health conditions and obesity, work is needed to encourage everyone to take steps towards becoming healthier through proper diet and exercise to make sure that our bodies are stronger to fight any virus! Efforts are also needed to address updated data and technology platforms, and workforce surge capacity. Knowledge that "in the US, 97 cents of every dollar goes to medical care, and only 3 cents goes to public health" should move us towards the need to spend more of our resources on the prevention side that Public Health needs."

George T. Roberts, Jr. FACHE, Chief Executive Officer, Northeast Texas Public Health District

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