Public Health 2030:

Scenarios for the Virginia Department of Health





Public Health 2030: Scenarios for the Virginia Department of Health

by the Virginia Department of Health and the Institute for Alternative Futures

supported by the Kresge Foundation and the Robert Wood Johnson Foundation

Using These Scenarios

Comparable organizations and communities can use these scenarios as a living tool for strategy formulation by using them to:

- 1. Test whether current strategies will be effective in the different scenarios.
- 2. Formulate strategies to more effectively adapt to the changing environment.
- Assure that strategic plans address the larger picture and longer-term futures for the public health community.

To use these scenarios in your own scenario workshop, visit <u>www.altfutures.org/publichealth2030</u> for a sample workshop agenda, instructions, worksheets, and presentation materials.

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Introduction

What will public health in the U.S. look like in 2030? What should public health leaders be doing today? The *Public Health 2030: Scenarios for the Virginia Department of Health* offer a tool for the Virginia Department of Health (VDH) and other comparable health departments to explore these questions at the level of their own jurisdictions. Scenarios can become a living tool for strategy formulation by allowing organizations to test and design current strategies to be effective in the different scenarios. Using these scenarios can help leaders and their organizations more effectively adapt to the changing environment. The scenarios consider a range of forces, challenges, and opportunities shaping local and national public health. They also offer a plausible set of expectable, challenging, and visionary pathways for how public health in Virginia may change over the years to 2030 and what VDH's role could be within these pathways.

Using preliminary sets of these scenarios, IAF designed and facilitated a scenario workshop with VDH staff and leaders to explore the three scenarios on December 9, 2013 at VDH headquarters in Richmond, Virginia. Via teleconference, the workshop also included participants from the VDH Health Districts. Together the participants considered potential public health goals and strategies for the future, as well as implications for the "robustness" of their current strategies in light of the various scenarios. The recommendations that they developed for VDH represent steps toward better public health futures for Virginia, and deserve support to promote and develop more effective public health. To use the finalized scenarios in your own workshop, visit www.altfutures.org/publichealth2030 for instructions, sample agendas, and presentation slides.

These Public Health 2030 scenarios for VDH and others are an important part of a larger project — Public Health 2030 — conducted by the Institute for Alternative Futures (IAF) and supported by the Kresge Foundation and the Robert Wood Johnson Foundation. In addition to developing scenarios for public health departments from four jurisdictions, including VDH, IAF developed a set of national public health scenarios available at www.altfutures.org/publichealth2030. Leaders and practitioners in public health and other sectors can consider their own work in the context of these national scenarios by challenging their own assumptions about the future, identifying emerging risks and opportunities, and formulating more robust strategies with greater potential to advance their mission over the decades to come.

Why Scenarios?

The future is uncertain. However, scenarios – different stories describing how the future may unfold – can be used to bound that uncertainty into a limited number of paths. These paths help us think about different probabilities in a larger space of possibilities. Scenarios also force us to consider the systems surrounding our topic and to clarify our assumptions. People who work with scenarios find more creative options than those who plan based only on the past and present. Strategies, plans, and actions can be "future tested" against the different scenarios to assure robust initiatives rather than continued efforts based on outdated assumptions. Scenarios are thus a powerful method for systematically addressing the uncertain future.

Process of Developing These Scenarios

Given the diversity of public health agencies across the U.S., IAF determined that we should develop scenarios for a few state and local public health agencies. In selecting jurisdictions, we sought diversity in size, region, political and economic conditions, and organizational forms. We chose a rural jurisdiction, a mid-sized jurisdiction (population of 250,000 to 750,000) and a large jurisdiction (population over 750,000). With assistance from the Association of State and Territorial Health Officials (ASTHO), we recruited VDH as a state case. We are grateful for the partnership of Cynthia Romero, former state health commissioner of Virginia, and Marissa Levine, Virginia State Health Commissioner.

IAF partnered with VDH staff to develop the scenarios using the "Aspirational Futures" approach (see **Figure 1** below) which IAF has evolved over the last three decades. The "aspirational futures" approach helps people understand and clarify where current trends may take us, what challenges we face, and what success might look like. This technique develops forecasts and scenarios in three zones:

- A "zone of conventional expectation" reflecting the extrapolation of known trends, a "most likely" or expectable future (scenario 1);
- A "zone of growing desperation" which presents a set of plausible challenges that an organization or field may face, a challenging future (scenario 2); and
- A "zone of high aspiration" in which a critical mass of stakeholders pursues visionary strategies and achieves surprising success (scenario 3).

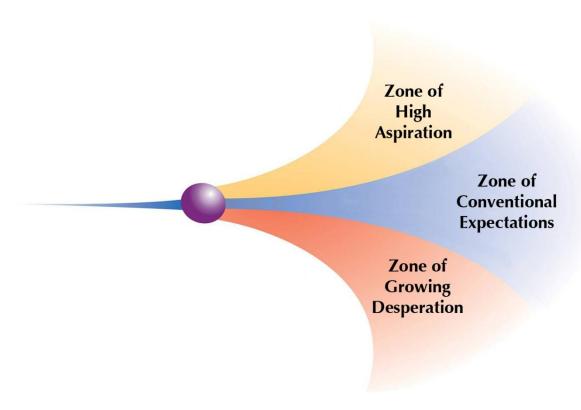


Figure 1: IAF's "Aspirational Futures" Approach

In developing these scenarios, IAF reviewed key VDH program areas, plans, and documents; and interviewed individual VDH program staff using a set of "driver forecasts" related to key factors shaping health. Based on this research, IAF then developed preliminary scenarios for review and discussion. Many of the comments we received during a VDH scenario workshop held on December 9, 2013, have been incorporated into the final scenarios.

In the next section, we present the finalized scenario narratives, followed by a matrix that allows for side-by-side comparison of the scenarios across multiple categories.

Public Health 2030: Scenarios for the Virginia Department of Health

Scenario 1: Changing Priorities, Declining Resources

Scenario Overview

Public health in Virginia made some progress over the two decades leading up to 2030. Advances in data and analysis, smarter and more effective inspections and certification, aspects of emergency preparedness, communicable disease protection, and health promotion. However, the ongoing federal and state budget cuts created more fiscal constraints for the Virginia Department of Health (VDH). In addition, VDH and other public health agencies periodically narrowed their program emphases on protecting from communicable diseases, emergency preparedness, and mandated licensing and certification. Although many areas of the state made health gains, many health disparities persisted or even increased overall.

Scenario Narrative

Over the two decades to 2030, political, fiscal, technological, and environmental challenges shaped and re-shaped the focus, programs, and services provided by the Virginia Department of Health (VDH) to promote health. Virginia's distinct regions each also had their differences. For example, the U.S. economy continued to recover and slowly grew throughout the 2010s and 2020s, punctuated by recessions in 2015 and 2022. Virginia's economy generally outperformed the national economy in this timespan. Decreases in defense spending, however, hurt the Hampton Roads area and slowed Northern Virginia's growth. Further, droughts driven by the growing impact of climate change hurt many of the agricultural zones throughout the state and flooding took its toll on all regions (especially Hampton Roads).

In this period, federal debt and deficit reduction measures kept national public health spending constrained, frequently favoring other programs over public health in budget battles. In health care this meant that as access to and the quality of health care significantly improved, federal funding cuts forced VDH and most other public health agencies (PHAs) to transition away from the direct delivery of screening or care for HIV/AIDS, maternal and child health, immunizations, and asthma. Instead, they focused on assuring a competent public and personal health care workforce, and evaluating the effectiveness, accessibility, and quality of personal and population-based health services. In public health, however, public health agencies (PHAs) were given the flexibility to use up to 5% of funding from their federal grants to pursue and maintain accreditation. Between 2015 and 2030, accreditation

requirements evolved to include the bolstering of foundational capabilities in developing policy; using integrated data sets; communicating with the public and other audiences to disseminate information; mobilizing the community and forging partnerships; cultivating leadership, organization, management, and business skills; demonstrating accountability for direct and indirect services; continuous quality improvement and transparency; and protecting the public in the event of an emergency or disaster.

Core VDH programs and services continued, but the vision for public health varied with each Governor. The state's general fund and special funds also continued to suffer from decreasing revenues. VDH obtained public health accreditation to improve its ability to weather the changes (after negotiating a reduced price for the central office and all of the districts combined). Nevertheless, VDH continued to oscillate in its non-core programmatic focus. Under Republican Governors, VDH focused more tightly on protection against infectious diseases, emergency preparedness, and mandated inspections and review. Under Democratic Governors, VDH increased its focus on supporting broader community prevention involving health promotion, injury and violence prevention, and health equity. In any case, however, VDH was pressed to be "smarter and leaner" through multiple, sometimes severe changes. These included the consolidation of local health departments, especially in rural regions, as well as recurring funding cuts to programs in environmental health, epidemiology, family health services, licensure and certification, and the Medical Examiner program.

Amidst funding changes and challenges, VDH had to help the state prepare for, respond to, and recover from a growing set of environmental challenges. In connection with climate change, Virginia was experiencing hotter and longer summers, along with more intense, widespread, and frequent heat waves. These conditions were particularly pronounced in Virginia's interior. Water shortages and crop damages grew. Droughts became more frequent during the summer and lasted longer than in previous decades. Asthma and allergy rates, air pollutants (including ozone), pollen, respiratory ills, and ragweed pollution all increased in most areas of the state. Thanks to the sea breeze, Virginia Beach was cooler during the summer than many other parts of the state, but it also experienced the worst and most frequent declines in air quality. While not present in "alarming" numbers, the incidence of dengue fever rose slowly throughout the state during the 2020s. By 2030, Virginians suffered from increased health risks because of droughts, infectious diseases, vector- and water-borne illnesses, floods, worsening air quality, and worsening heat. Vulnerable populations such as the poor, homeless, elderly, and children suffered the most during the summers from these calamities as food and water prices rose and outdoor conditions deteriorated.

Virginia Beach and other coastal areas had their own unique sets of health risks to face as well. As ocean temperatures rose, algal blooms proliferated. Marine toxins in shellfish more frequently made their way into the food supply, spreading food-borne illness. Coastal areas also faced higher storm surges that accompanied more powerful hurricanes. The Chesapeake Bay region suffered from land loss and infrastructure damage as sea levels rose. During some floods in the late 2010s and throughout the 2020s, the cities of Alexandria, Richmond, and Lynchburg suffered from combined storm water and sewer overflows. The frequency of injuries and water-borne diseases after extreme precipitation and storms thus grew in both coastal areas and within the Virginia interior, though to different extents. In addition, vector-borne diseases began to spread throughout both geographies.

VDH sought to prepare communities for these challenges by enhancing remote monitoring, including the use of drones and links to personal, community, and private sector monitoring systems. Situation awareness and decision-making was also enhanced by cloud-based analytics. However, VDH's capacity to take action in advance of or coordinate responses after extreme weather events varied across the

districts. Repeated challenges with extreme weather events, however, led the public in many parts of the state to better understand and appreciate VDH's emergency preparedness work over the years to 2030.

While environmental challenges grew and increasingly threatened the health of Americans, national health care reform progressed despite a rocky start. Further, Virginia signed on to Medicaid expansion, enrolling nearly 400,000 Virginians. Health care providers formed and joined Accountable Care Organizations (ACOs) with integrated and largely capitated care serving most Virginians. Most of these ACOs worked to improve population health by focusing on the provision of highly coordinated care and by increasing patient engagement.

Some health care providers expanded their efforts to press beyond the clinic and improve community conditions shaping health. These ACOs supported community organizations' efforts to, for example, increase employment, or to enhance safety, availability of quality housing, education, or nutritious food. In some areas of the state, public health and health care providers had good relationships with better outcomes (especially in areas with little competition among the providers); in more competitive areas (e.g., NOVA), however, there was less cooperation with VDH.

The spread of ACOs and the rollout of health care reform accelerated and promoted the adoption of electronic health records (EHRs). As the cost of individual genome mapping declined, EHRs expanded to include each person's genetic code. The massive EHR data enhanced the accuracy of diagnoses and the effectiveness of prescriptions and health care. Treatment protocols used by health care provider organizations were continuously updated with the latest research. As care and access thus improved for many Virginians throughout the 2010s and 2020s, some work still remained in assuring access to effective care for some rural and low-income communities. VDH encouraged the development of Federally Qualified Health Centers (FQHCs) and the deployment of community health workers and public health nurses. It also worked to set standards for and encourage the effective use of telemedicine/telehealth for patients in those communities. The universal provision of screening and counseling for chronic conditions and intimate partner violence fueled the demand for public health services as well. Unfortunately, funding limitations often prevented the development of systemic solutions.

Amidst the evolution of remote monitoring, EHRs and information technology, VDH was influential in defining how health information was collected, aggregated, and disseminated. This included the automation and public transparency of monitoring and inspections. Information on reportable events or conditions was automatically forwarded to VDH. Secure state-controlled data vaults in the cloud facilitated surveillance by aggregating data from EHRs, environmental monitoring, driver's licenses, and social services information. VDH analyzed these "big data" to assess patterns and evaluate impact, create new triggers and alerts, and improve prevention and coordination. Advances in cognitive computing—expert systems that followed the early "Doc Watson" supercomputer applications by IBM—were also applied to public health, facilitating up-to-date assessments of what community problems or issues needed to be dealt with and the identification of the most cost-effective solutions.

Throughout the 2010s and 2020s, the proliferation of data and improvements in mapping with which VDH worked was also affected by the evolution of the Internet and mobile communications. Smart phone usage had become universal in the U.S. by 2018, with a wide range of price levels for phones and data services. Many of these were relatively low-cost, but still allowed high-speed data transfer. Most computing thus went mobile. The use of sensors for personal biomonitoring had also expanded. Both

private and public sector funding was increasingly made available for the installation of environmental sensors in most Virginia communities and neighborhoods in what became known as the "Internet of Things" (IoT), in which a large proportion of devices and appliances could communicate over the Internet. The increasing amounts of data on air and water quality, housing conditions, waste management, urban agriculture, safety, walkability, and energy use were aggregated to help communities understand their conditions in real-time. Social media behaviors were included in this mix as well, with natural language ontologies and advanced analytics enabling appropriate interpretations of social media data. As mapping thus improved, the Virginia Performs website became a go-to place for metrics on a wide range of conditions, and citizens around the state used it to support personal and community health. VDH assured the quality of the data collection and routinely mined the aggregated data to assess health conditions in neighborhoods.

By 2030, the state has successfully improved infant mortality and vaccination rates. However, many health disparities persist or even increased amidst fiscal and environmental challenges. These challenges have thwarted the promise of advancing technological capabilities, improving public health services, and health care reform. VDH staff often wonder how things might have turned out differently had the public health priorities of Virginia been consistent and its funding not reduced.

Scenario 2: Overwhelmed and Ineffective

Scenario Overview

Throughout the 2010s and 2020s, Virginia and the rest of the U.S. faced major economic and environmental challenges. Federal, state and local governments cut spending. Public health spending was particularly affected. The Virginia Department of Health focused primarily on mandated regulation, infectious disease prevention, and emergency preparedness. Many of the gains made in safety-net health care programming, community prevention, and chronic disease control lost ground compared to previous decades. As a result, the health gaps between the "haves" and "have-nots" became more pronounced by 2030, and Virginia faced profound challenges in attempting to return to the levels of health seen just two decades earlier.

Scenario Narrative

The State of Virginia was hit with recurring and overwhelming challenges over the 2010s and 2020s: the national economy saw severe recessions in 2016 and 2023; federal spending cuts in civilian and defense programs hurt the state; and health care reform faltered and the number of Virginians who were uninsured or lacked effective access to care grew. Furthermore, climate change raised recurring challenges with significant damages to crops, homes and local economies. As the state's revenues and spending declined, most local jurisdictions retrenched their spending.

Amidst these fiscal, environmental, and health care challenges, the Virginia Department of Health (VDH) strived to improve the quality of its work – but virtually all of its employees had to take on more tasks with fewer supporting resources and many functions and services were eliminated altogether. Over the years to 2030, Virginia maintained its pattern of alternating between political parties in the Governor's Mansion. In some administrations, the prevailing attitude was that public health should do only the required protection from infectious disease, emergency preparedness, and health facility and food services inspections. In other administrations, public health was seen to have a much more fulsome role. However, fiscal austerity made it hard to restore programs once they were cut.

Nevertheless, the need for public health services grew more each year. Climate change was one cause of this growing need. By 2020, political groups could no longer deny the reality of anthropogenic (human-induced) climate change. Every year, summers seemed to be getting hotter and longer, and heat waves had become widespread. Consecutive periods of intense drought had severely hurt agricultural yields throughout Virginia and the rest of the Southeast U.S. Malnutrition rates had risen among the poor and homeless. Food and water prices were rising around the world, and Virginia was no exception. Water had become a fiercely contested commodity and water quality was frequently challenged during severe storms.

As severe storms became more frequent, 2016 marked a turning point in the health and wellbeing of Virginia residents. A Category IV hurricane hit the Hampton Roads area directly and made its way inland towards and beyond Richmond, flooding many parts of the state. Under VDH's recognized leadership in emergency preparedness, evacuation in the face of the storm was done fairly well. Medically vulnerable

registered persons were moved to other hospitals, nursing homes, and shelters in the days and hours before the storm arrived. Surprisingly, however, dozens of "less vulnerable" Virginians did not reach safe shelters in time and were killed or injured as a result of the storm. Many of these and other Virginians had refused to sign up for the state's registries for emergency preparedness as a response to the 2013 revelations about information collection by the NSA and similar privacy intrusions in subsequent years. In the aftermath of the hurricane and the consequent flooding, hospitals were overwhelmed by the number of patients seeking medical care, while nosocomial infections rose simultaneously.

During and after the rains from the storm, Lynchburg and Richmond experienced combined sewer overflows that contaminated their water. Food-, water-, and vector-borne diseases (particularly from rats and mosquitoes) had been growing with the hotter weather and proliferated after the storm. Likewise, rising ocean temperatures had fueled the Hurricane's strength, while the storm and its aftermath resulted in increased sewage pollution and heightened levels of toxins in shellfish, leading to the prolonged closing of many shellfish collection areas.

The infrastructure of many homes, businesses, and neighborhoods had also been destroyed or greatly damaged by the hurricane. Power outages and electrical fires became frequent in low-lying and low-income areas. Many coastal areas had already been threatened by sea level rise, and the storm surge and torrential rains from the hurricane inundated many of these areas. The storm and its aftermath created a class of environmental refugees within Virginia from these and other areas. While these refugees hailed from all racial and ethnic backgrounds, they were primarily low-income and/or non-citizens.

Recovery was slow and uneven. FEMA had been expected to lead and coordinate the preparation and recovery efforts for storms such as this one. Although FEMA did play a major role in preparation, it was much less forthcoming in terms of recovery support and funding. The state and VDH were severely strained in trying to find the funding, human capital, and resources to help the people and communities of Virginia recover. Several years passed with unsatisfactory progress.

Recovery was slowed by other environmental conditions. The summer of 2020 was referred to by many Virginians as "the first summer when we couldn't breathe," and was followed consistently by "suffocation summers." Air quality for the state had deteriorated devastatingly. Air pollutants (including ozone), pollen, and ragweed pollution all took their toll on children, the elderly, and people with asthma. Allergy rates, respiratory ills, and asthma cases skyrocketed, overwhelming emergency rooms and hospitals. The Environmental Protection Agency's air quality standards were so often violated, particularly in Virginia Beach, that some proposed loosening the standards themselves.

As if "suffocation summers" were not bad enough, Virginians also had to come to terms with formerly eradicated infectious diseases. In 2012, there had been 17 cases of dengue fever in Virginia, all contracted outside the U.S. or the state and imported by the infected person. Given the presence of the disease and increased mosquito breeding, however, dengue fever grew and even became established in parts of the state. By the mid-2020s, there were frequent, isolated breakouts of dengue fever that particularly affected the poor, homeless, elderly, and children. What alarmed Virginia authorities the most, however, was the re-emergence of malaria, which had not been common in the state for generations. The incidence grew from an average of 50 to 60 cases in Virginia per year from 2003 to 2010, to hundreds of cases per year in the state by 2024. Furthermore, the mosquito breeding season had gradually lengthened. Being outside without mosquito protection thus became a significant health risk in many parts of the state.

While the environment in Virginia was worsening, so was health care in many parts of the state. After a very rocky initial enrollment period in 2013 and 2014, and after Republicans gained more seats in Congress after the 2014 election, health care reform was amended. New legislation stepped back from requiring coverage, allowed low-cost low-coverage plans, and removed some incentives for the development of Accountable Care Organizations (ACOs). Some ACOs did emerge, and they focused on reducing costs. However, few health providers focused on improving population health. Health care costs continued to rise, in spite of major efforts by Medicare, Medicaid, and private insurers to lower costs (often by paying less per procedure). The use of electronic health records (EHRs) grew inconsistently and were not fully interoperable. Similarly, biomonitoring and the use of apps for smart phones grew and became important for many people in enhancing their care, but smart phones and data plans remained costly and most EHR systems could not integrate personal biomonitoring data anyway. Environmental monitoring also improved in many communities, particularly more affluent communities. These novel data streams, however, were seldom integrated into health records. Instead, the great promise of enhanced personal data in EHRs only extended to genomic data in some health systems. Health systems and hospitals analyzed the patterns among their own patients to improve care and treatment and reported to VDH the 50-some reportable conditions. VDH, however, was unable to take advantage of the EHR data due to challenges with interoperability.

Significant funding challenges remained across VDH programs and services. Federal and state funds were cut for many programs in spite of the growing need for these services. VDH's epidemiology and other units evaluated their outcomes and showed the return on investment (ROI) of VDH and its programs. Due to a lack of revenues, programs and service levels still received cuts even when they showed a positive ROI. In some cases, the state reduced its share of a matching fund, leading to still further federal cuts. Similarly, many localities were unable to make their full portion of matching fund programs.

Given the decline in funding, many districts consolidated. By 2030, VDH has dropped many programs and services, leaving it to focus on mandated regulation, infectious disease prevention, and emergency preparedness. VDH's commitment to health equity remains, but it can do little to combat growing social, economic, and health disparities. This has been exacerbated by staffing shortages. As VDH staff members were required to be more data savvy, and to take on more tasks with less support and pay, many retired out of dissatisfaction. Although there were people willing to fill those vacant positions, VDH was unable to hire them, leaving the agency severely shorthanded.

Scenario 3: Successful Chief Health Strategist

Scenario Overview

Over the years to 2030, all Virginia state agencies adopted the "Health in All Policies" approach, and the state developed Healthy Virginia goals and metrics. Federal investments, networked monitoring systems, and the aggregation of conventional and novel data streams facilitated surveillance, planning, and self-regulation. Nearly all Virginians gained access to effective, capitated, and integrated care. The Virginia Department of Health (VDH) partnered with health care providers and others to create the conditions for all Virginians to thrive, largely by identifying and accelerating promising opportunities and practices, community-oriented initiatives, and policies. As a result, by 2030 the state successfully eliminated structural disparities relating to race, poverty, and zip code.

Scenario Narrative

A social value shift towards health, wellbeing, and equity took place nationally throughout the 2010s. For several decades, the *Healthy People* goals had established benchmarks and monitored progress to encourage collaborations across communities and sectors, empower individuals toward making informed health decisions, and measure the impact of prevention activities. By the late 2010s, initiatives like the National Prevention Strategy, the Patient Protection and Affordable Care Act (PPACA), Community Transformation Grants, and the spread of health impact assessments had further helped the "Health in All Policies" (HiAP) lens take hold and engage more agencies outside of the traditional health world.

Further, by 2017, as the U.S. economy improved, Congress had returned the Prevention and Public Health Fund to the level originally called for in the PPACA legislation – namely \$2 billion a year. However, federal programs such as the Ryan White HIV/AIDS, Maternal and Child Health, WIC, and Vaccines for Children programs were reduced or eliminated by 2020. By then, nearly all residents had gained access to insurance (which expanded to cover nutrition counseling as well) and effective, capitated and integrated health care thanks to the aggressive expansion of Accountable Care Organizations (ACOs) and Patient-Centered Medical Homes (PCMHs). Provider shortages had been alleviated through the growth of medical residency opportunities in community health centers (CHCs), the effective use of telemedicine and digital coaches, and increasing deployment of community health workers and public health nurses. With these changes, most public health agencies (PHAs) moved away from the provision of direct clinical services and instead used up to an authorized 10% of their federal funding streams to pursue accreditation and improve foundational capabilities.

These national trends also held true in Virginia, with various regional differences. The Virginia economy was strong overall and experienced modest growth throughout the 2010s and 2020s. While the political climate in the state remained purple, moderate and liberal candidates (including an experienced public health official as Virginia governor) carried most of the five elections over the years to 2030.

Yet the state's default action of reducing budgets continued to focus minds on costs and how to contain or eliminate them. As a result, local health departments consolidated by the late 2010s. Cost control measures and improvements in health care also reduced overall VDH funding, especially from federal

and general financing sources. VDH largely moved out of direct services and shifted to an assurance role with an increasingly smaller cadre of staff. Funding for some programs, such as prevention and emergency preparedness, remained stable. However, as VDH's need for state dollars grew, so did the challenge to demonstrate the return on investment (ROI) of its services and efforts. All health districts and the central health department office in Richmond pursued accreditation and improved their foundational capabilities, which helped them show the outcomes of their work.

To further control costs and improve its services, the state developed a secure, statewide data vault in the cloud that aggregated data streams from government agencies and many health data sources, such as the state-wide health insurance marketplace, health impact assessments, and electronic health record (EHR) systems. By 2016, EHR systems had become networked, interoperable, and ubiquitous. By 2018 they had expanded to integrate personalized vital signs based on each patient's genetic information, social determinants of health, and personal biomonitoring tools that provided nearly continuous passive monitoring. The state also aggregated data from novel sources like the health impact assessments, as well as smart sensors placed throughout the state and in personal devices that provided granular data on air and water quality, housing conditions, waste management, rural and urban agriculture, safety, walkability, and energy use. Social media interactions were included in this mix as well, with natural language ontologies and advanced analytics that enabled appropriate interpretations of social media data. Additionally, social networking data became more representative of the community, as the digital divide among Virginians was reduced with the support of subsidized basic data plans and smart phones.

VDH supported data privacy and discrimination protections, and by 2020 the successful incorporation of new data sources and computational methods allowed VDH – in collaboration with ACOs, universities, and citizen scientists – to convert mapping and community health assessments into a real-time virtual simulation of public health in Virginia. Interventions could now be effectively modeled and their impacts explored. Enhanced mapping and simulations also improved targeted emergency preparedness and sped up the response to infectious disease outbreaks, which were becoming more prominent with the growing frequency of climate change-driven challenges. VDH and health districts used scenarios and simulations to inform pre-event resilience gaming activities that helped community groups imagine and practice "emergent" roles. These roles had been routine since 2012, after Occupy Sandy (an offshoot of Occupy Wall Street) had mobilized volunteers to collect, distribute, and deliver food and supplies, all within hours of Hurricane Sandy's dissipation.

The monitoring of the environment, patients, and institutions was also increasingly automated. VDH encouraged more self-regulation among licensing and inspected institutions, and engaged private citizens and businesses in monitoring for toxins. Restaurant inspections became largely automated by incorporating video monitoring, air quality sensors, and embedded temperature sensors. VDH provided quality control for these automated monitoring system, and the data and safety analyses were fed to VDH as well as consumer groups. VDH posted its restaurant inspections routinely to social networks and mobile apps. Yelp! and other rating sites integrated environmental health and safety data with their members' ratings of the food quality. Combined, these changes successfully reduced food and water safety violations.

VDH's expertise in mapping and health simulations made VDH the go-to entity for ACOs, which had discovered the importance of identifying and designing the most cost-effective strategies and efforts to improve population health. Clinically, rural health care had improved over the 2010s through sophisticated virtual care and self-management, effective care from community health workers

(CHWs)/public health nurses, and the development of Federally Qualified Health Centers (FQHCs) as encouraged by VDH. In partnership with health care providers, VDH also successfully eliminated tuberculosis in the state. However, universal screening for domestic violence and other public health concerns that were built into patient assessments by primary care made it clear that improving population health required moving beyond health care services alone to caring for the *whole* person and their community.

The partnership between health care and VDH to improve population health and address the social determinants of health helped fuel the evolution of primary care teams from the Patient-Centered Medical Home (PCMH) to the Community-Centered Health Home (CCHH). CCHHs deployed broader care teams that coordinated care for the individual, while also analyzing community conditions and health patterns, and working with the communities to improve them. VDH and health districts facilitated the community analyses needed by CCHHs, advised on the design of policies, and facilitated enhanced community-based efforts to improve community conditions.

To guide long-term decision making and targeting of resources, and to increase community engagement, the Governor's office developed *Healthy Virginia* goals and metrics with support from VDH. These goals and metrics incorporated health equity and the fostering of entrepreneurialism in communities. To facilitate the successful pursuit of these goals, the state's health commissioner appointment process was changed to become independent of the Governor's Office. The State also opened a school of public health that reinvented what public health education looks like in the 21st century, putting students on the front lines of community engagement. VDH developed health dashboards for each community to monitor progress on their goals. VDH also developed virtual simulations that public health researchers and others could explore by playing out different scenarios that considered potential interventions as well as pandemics and extreme weather events. *Healthy Virginia* included games and other means that engaged large numbers of Virginians, enhancing their awareness of inequities and the role of the social determinants of health. These games and interventions increased Virginians' commitment to fairness and health equity. These in turn influenced voting by residents on *Healthy Virginia* priorities.

As chief health strategist, VDH used its mapping and simulation capabilities, as well as convening powers and linkages to schools, researchers, businesses, residents, and other partners to pursue *Healthy Virginia* goals, and to support Health in All Policies, community involvement, and health equity. VDH thus led other non-health state agencies to incorporate health goals into their strategic planning and business practices and policies. In education, for example, all Virginia school systems integrated injury and violence prevention programs and services. School districts mapped students' test results to community conditions, and identified the neighborhoods that would benefit most additional or improved mentoring, tutoring, after school programming and other activities to support students' learning and educational attainment. School districts also became key players in community efforts to nurture self-esteem and self-respect within stigmatized groups, and worked to use education to reduce racial bias and raise awareness of racism.

Community planning was also linked to goals of improving population health and decreasing sedentariness. This promoted the development of safe and affordable places to be physically active—including parks and green spaces—and the minimization of liquor, fast food, and cigarette outlets. In economic development, VDH and health districts promoted the fostering of community entrepreneurialism, development of job matching and training programs, and the promotion or creation of affordable transportation options. Access to healthy and affordable foods improved with the growth

of urban gardening, monitored and facilitated by VDH and health districts. VDH and health districts worked with health care providers and app developers to ensure that relevant programs and analyses were both functionally effective and culturally appropriate for vulnerable or marginalized populations in the state. VDH also facilitated the integration of benchmarks for improving equity and eliminating racism into the licensing, credentialing, and regulation activities conducted by the state government.

In 2030, Health in All Policies, as well as health equity goals, metrics, and evaluations, all permeate Virginia agencies. The performance and delivery of public health services that remain with VDH and health districts – whether provided directly or indirectly – have improved in their quality and reach. In fact, public health has become part of the fabric of the community. VDH informs planning, policies, and community-based efforts that address and eliminate disproportionate burdens of social, environmental, and economic factors that shape health and economic development. For its work, VDH is widely recognized as the state's chief health strategist and is lauded for its role in the elimination of tuberculosis and structural health disparities.

SCENARIO MATRIX

The following pages offer a side-by-side comparison of the scenarios across multiple dimensions. Each column is consistent with but not solely duplicative of the respective scenario.

	Scenario #1	Scenario #2	Scenario #3
	THE MACRO	AND OPERATING ENVIRONMENTS	
U.S. Economy	Slow economic growth with recessions in 2015 and 2022; debt and deficits lead to periodic cuts in federal spending.	Intermittent growth; severe recessions in 2016 and 2023; federal government cuts are severe.	Strong economic recovery. Some states institute living wages.
Virginia Economy	Generally healthy, varies by region. Decreases in military spending affect Hampton Roads and NOVA, droughts hurt agricultural zones.	Slow growth in some regions, especially NOVA; others barely recover between recessions. Droughts and floods affect agriculture; 2016 hurricane devastates the state.	Generally healthy, modest growth throughout the 2010s and 2020s. Decreases in military spending affect Hampton Roads and NOVA.
Virginia Government, Political Climate	A "purple" state, though more "blue" over time as demographic shifts make young and minorities a larger % of voters; non-political redistricting after 2020 leads to more competitive districts.	Alternating "blue" and "red" – Republican administrations seek to limit public health to emergency preparedness, infectious disease control, and mandated health and safety inspections and licensure. Democratic administrations can't afford to spend any more to restore programs and services.	A "purple" state, though more "blue" over time as demographic shifts make young and minorities a larger % of voters; non-political redistricting after 2020 leads to more competitive districts.
Internet, Social Media, Communications	Mobile devices and smart phones are ubiquitous, basic services are subsidized. This reduces digital divide. Enhanced intelligence, surveillance and marketing enabled by social media, cloud enabled storage, access and analytic services. Social media enhances citizen and community	Internet, smart phone, social media revolutions continue, but age, cultural and economic divides grow. Internet privacy and security threats grow. Social media reinforces differences, keeps groups isolated. Biomonitoring used by affluent and some	Subsidized smartphones with basic data packages lower digital divide. Personal biomonitoring and app data feed into EHRs and aggregations of data streams for surveillance, planning, and simulations. Social media enhances citizen and community participation in policymaking and community
	participation in policymaking and community health enhancement.	health care EHR systems, but not most.	health enhancement.

	Scenario #1	Scenario #2	Scenario #3
	THE MACRO	AND OPERATING ENVIRONMENTS	
Environmental Threats and Impacts	Hurricanes, floods, and drought. Vulnerable populations suffer disproportionate environmental impacts.	Hurricanes, floods, drought, and "suffocation summers." Category 4 Hurricane leaves extensive damage, prolonged power outages. Vulnerable populations suffer disproportionate environmental impacts. Environmental refugees are common.	Hurricanes, floods, and drought. Event impacts reduced and recovery improved with targeted emergency preparedness and pre-event community resilience gaming activities. "Emergent" roles are routine, volunteer groups collect, distribute, and deliver food and supplies within hours of storms.
Health Care in Virginia	Nearly all residents are insured, but many with high deductible plans. Most providers become or join ACOs, consolidate, become more integrated and capitated. FQHCs expand. Telehealth improves access to care for rural and low-income areas.	Coverage does not improve, many continue to lack access to care. Most health providers do not work to increase population health. FQHC expansion hindered by reduced funding. Telehealth and enhanced self-care increase, especially in rural areas, but vary in outcomes.	Nearly all residents gain access to coverage and effective capitated and integrated care through ACOs. FQHCs, medical residencies in CHCs, telehealth, digital coaches, community health workers and public health nurses successfully eliminate disparities in access and quality of care for rural and low-income areas.
Health Information Capacity	EHRs become universal but vary in quality and interoperability. Cloud-based aggregation and analytics. Genomic and biomonitoring data included in the EHR.	EHRs become universal but vary in quality and interoperability. Only some have access to cloud-based aggregation and analytics, depending on staff and budgets. Genomic data included in some EHR systems.	Networked, interoperable, and ubiquitous EHR systems. Cloud-based aggregation and analytics. Genomic, biomonitoring, social determinants of health, and social network data included in the EHR.
Role of Health Care in Population Health	Varies by region and provider – Some ACOs pursue population health by focusing on their patients; others increase community health contributions, working with community organizations and VDH district offices.	Few health providers work to increase population health.	Varies by region and provider – Most ACOs increase community health contributions, working with community organizations and VDH district offices.

	Scenario #1	Scenario #2	Scenario #3
	THE MACRO	AND OPERATING ENVIRONMENTS	
Citizen Science	Grows in Virginia, particularly more affluent communities, exposing health and environmental problems.	Grows in Virginia, particularly more affluent communities, exposing health and environmental problems.	Grows in Virginia, exposing health and environmental problems for all communities.
Health Equity/ Disparities	Some health disparities reduced, particularly disparities in the rates of infant mortality and vaccinations.	Health disparities increase	All health disparities are eliminated.
	VIRGINIA	DEPARTMENT OF HEALTH (VDH)	
VDH Funding	Stable to declining State funds depending on administration – more loses of General Fund revenues. Federal funds cut for direct health services programs, stable for others with flexibility to use categorical funds to support accreditation. Emergency Preparedness funds decline until after major events. Licensing and inspections charge their full costs.	Cuts followed by stability, with little ability to restore program funding. More cuts as state economy and funds are challenged. Federal funds reduced for most programs because of lower taxes and poor state of the economy. Many localities have difficulty making their % of the match. Licensing and inspections charge their full costs, some customers have difficulty paying.	Stable State funds. Ability to use 10% of federal funding streams to pursue accreditation and improve foundational capabilities. Federal funds cut for direct health services programs.
IT and Informatics	Statewide data infrastructure and systems, periodically improved, enhance surveillance. VDH data warehouse improves coordination among VDH divisions Secure state-controlled data vaults in the cloud allow for aggregation and cross-provider analysis of large numbers of records, including environmental monitoring, driver's license information, and social services information.	Statewide data infrastructure and systems periodically improved in patches. Secure state-controlled data vaults in the cloud, turnout to not be secure; much of the data is not interoperable. Public distrust hinders collections and sharing. VDH can buy big data analytics from private companies, but can seldom afford to do so.	Statewide data infrastructure and systems, periodically improved, enhance surveillance, provides advanced analytics and simulations for evaluation, quality improvements, and playing out scenarios. Secure state-controlled data vaults in the cloud allow for aggregation and cross-provider analysis of EHRs, environmental monitoring, and socioeconomic data streams.

	Scenario #1	Scenario #2	Scenario #3
	VIRGINIA	DEPARTMENT OF HEALTH (VDH)	
Local Health Districts	LHDs' efforts reflect evolving priorities, need to do more with less funds and staff; Consolidation among smaller and rural Districts – 24 districts in 2030.	LHDs' efforts focus on infectious disease control, emergency preparedness, inspections and licensing. Significant consolidation among smaller and rural Districts – 24 districts in 2030.	LHDs' pursue Healthy Virginia goals. Consolidation among smaller and rural Districts – 30 districts in 2030.
Accreditation	VDH and its districts accredited by 2018 after package deal arranged with PHAB to lower total costs. Accreditation process facilitates improvements in foundational capabilities.	VDH unable to afford accreditation for many years, then cuts in critical VDH functions lead VDH to avoid accreditation. VDH loses access to some federal competitive grants because of lack of accreditation.	VDH and health districts are accredited, use federal funding streams to improve foundational capabilities. VDH funding increases as a result of accreditation.
Epidemiology, Disease investigation and Control	Small central office staff ensures systems that give local health departments updated analyses and alerts. Demonstrates ROI of VDH services. Focuses on surveillance, investigation, and environmental epidemiology, quality control of HIV/AIDS services provided by health care and progress of HIV/AIDS Pharmacy services reduced as federal funds and programs are reduced.	Small central office staff provides local health departments with updated analyses and alerts. Asthma monitoring grows as poor air quality of "suffocation summers" increases asthma incidence. Pharmacy services reduced as federal funds, programs reduced STD prevention remains a major focus of VDH.	Smaller staff size with better pay. Focus on ROI of VDH services, surveillance, investigation, and environmental epidemiology. Pharmacy services reduced as federal funds and programs are reduced.

	Scenario #1	Scenario #2	Scenario #3
	VIRGINIA	DEPARTMENT OF HEALTH (VDH)	
Emergency Preparedness, Response, and Recovery	For health districts and licensed institutions, VDH coordinates preparation, resilience and recovery. Situation awareness and decision-making enhanced by cloud based analytics. Increase in remote monitoring, including drones and links to personal, community and company monitoring. Enhanced preparation lowers rate of morbidity, mortality, including incapacitation because of injuries, shortens recovery time. All-hazards preparedness and response funding from state declines. VDH remains best in country but nearly totally dependent on fluctuating Federal funds.	For health districts and licensed institutions, VDH coordinates preparation, resilience and recovery. Situation awareness and decision-making periodically enhanced by cloud based analytics. Some increase in remote and automated monitoring. Registry participation limited by lack of trust, privacy violations. FEMA takes partial lead in 2016 Hurricane preparation but falls short on recovery. All-hazards preparedness and response funding from state declines.	Provides communication quality control for emergencies. Supports Occupy Sandy-like volunteer organized relief efforts. Able to better predict natural disasters and respond and recover from those events with backing of central and local offices. Targets people with limited resources, while more affluent communities take care of their own preparedness. Fosters pre-storm, pre-event resilience, particularly by enhancing community conditions. Includes health equity improvement as a strategy to improve preparedness.
Public Health Nursing	Declining number of PHNs and Senior PHNs as some federal and state programs end. PHNs brought into FQHCs to enhance their primary care workforce. PHNs maintain strong presence in Virginia public schools. PHNs successfully demonstrate measureable outcomes (decreased readmits, ER visits, medication noncompliance, proper use of Durable Medical Equipment) and are brought into managed care organizations.	Declining number of PHNS and Senior PHNs as some federal and state programs end. Many PHN related programs and services cut. School health presence becomes intermittent, at times unfunded.	Shift away from family planning and prenatal care as health care providers do this. Increased involvement in chronic disease control and prevention. Increased partnerships with FQHCs and encourage their development. PHNs successfully demonstrate measureable outcomes and are brought into managed care organizations.

	Scenario #1	Scenario #2	Scenario #3		
	VIRGINIA DEPARTMENT OF HEALTH (VDH)				
Environmental Health Services	Maintains inspections of restaurants, pools, hotels, campgrounds, summer camps, milk plants, migrant labor camps, private wells and onsite sewage disposal systems.	Maintains inspections of restaurants, pools, hotels, campgrounds, summer camps, milk plants, migrant labor camps, private wells and onsite sewage disposal systems.	Shift toward self-regulating inspection systems. Restaurant inspections, for example, are automated, incorporating video monitoring and games to improve compliance.		
	Much inspection is automated, some done by private sector companies; smart apps speed up and integrate data; results are public, and for	Some inspections are automated, some done by private sector companies.	Yelp! and other rating sites integrate environmental health data.		
	restaurants, included in consumer ratings. Stable or declining general funds, push to	Data collections not consistent; but include inventory of all onsite sewage systems, private wells.	Gaming and simulations used for food safety and other training.		
	increase special revenue and fees from those inspected. Enforcement/civil penalties remain a major role for EHS.	Stable or declining general funds, push to increase special revenue and fees from those inspected. Enforcement/civil penalties remain	Extensive State and private databases are integrated in the cloud, including inventory of all onsite sewage systems, private wells and other data relevant to population health.		
	Foodborne pathogens increase and have bigger impacts.	a major role for EHS. Some of those inspected can't afford the costs.	Health relevance of these are understood (e.g. water quality from recharging aquifers with waste water).		
	Shellfish and coastal water and well water quality impacted by eroding coast lines as sea levels rise, eroding sewage systems and wells,	Foodborne pathogens increase and have bigger impacts.			
	threats to shellfish and water quality, and legal challenges with disappearing lands.	Shellfish and coastal water and well water quality severely impacted by eroding coast lines as sea levels rise, eroding sewage systems and wells, threats to shellfish and water quality, and legal challenges with disappearing lands. 2016 Hurricane severely worsened these.			

	Scenario #1	Scenario #2	Scenario #3
	VIRGINIA	DEPARTMENT OF HEALTH (VDH)	
Licensure and Certification	VDH begins to charge full cost for services. VDH remains in licensing facilities; doesn't do inspections; facilities to have policies for doing monitoring which is increasingly automated. Results are transparent and used in consumer/patient rating services. Continues to license abortion clinics, physician offices, long-term care facilities, home care organizations.	VDH begins to charge full cost for services. VDH remains in licensing and inspecting facilities abortion clinics, physician offices, long-term care facilities, home care organizations.	Charges full cost of services. System gets overhauled with improvements to data quality and collection. Develops different tiers of licenses that build in performance measures Redefines licensing for home care because of remote monitoring. Growing shift toward self-regulating systems facilitate licensing and inspections.
Injury and Violence Prevention	Funding remains stable. Some additional funding for domestic violence as a result of evaluation results from pilot programs. Health care provides universal screening for intimate partner violence, fuels demand for services. VDH moves away from one-on-one services. Programming expands to include focus on elder violence, and impact of violence on children Continues provider-focused initiatives, expands to include work in addressing prescription misuse and unintentional poisonings.	Injury and violence prevention funds for eliminated. Local health districts integrate injury and violence prevention into remaining school health programs.	Funding remains stable. Some additional funding for domestic violence as a result of evaluation results from pilot programs. Health care provides universal screening for intimate partner violence, fuels demand for services. VDH moves away from one-on-one services. VDH's role moves beyond general awareness and outreach to support calls for action and behavioral change. Promotes and works with health care on quality improvements and inclusion/reducing inequities. Works with all Virginia school systems in capacity building for injury and violence prevention.

	Scenario #1	Scenario #2	Scenario #3
	VIRGINIA	DEPARTMENT OF HEALTH (VDH)	
Chronic Disease Prevention (Family Health	Health care provides universal screening and counseling for tobacco use and chronic conditions.	Workplaces and schools are inconsistent in their adoption of policies that prevent and control the use of smoking and vaping.	Health care provides universal screening and counseling for tobacco use and chronic conditions.
Services)	Federal funds for most disease prevention programs reduced over time.	Federal and state funds reduced then eliminated for most chronic disease programs.	Federal funds for most disease prevention programs reduced over time.
	VDH continues to foster tobacco free living, all health department locations and campuses are tobacco-free; clinical and community preventive services; healthy communities; healthy eating/active living in communities. Works to integrate LHD community assessment with health providers' community needs	VDH, central and LHDs encourage community groups, health care providers to pursue prevention.	Aggressive packaging requirements and tax increases on tobacco products, and bans on smoking in all parks, workplaces, and schools reduce smoking and youth initiation. VDH continues to foster tobacco free living; clinical and community preventive services; healthy communities; healthy eating/ active living in communities.
	assessments.		ACOs, health care providers integrate with LHD community assessment with hospitals' required community needs assessments; achieve great community consciousness, shared targeting of projects.
Nutrition Services, Community Nutrition	Facilitates services through automation, expands nutrition education through digital tools, uses mapping to identify/address gaps. Expands partnerships to all 120 school systems,	Federal WIC funds continue but are reduced. VDH continues facilitating participation, nutrition education, promoting breast feeding and community gardening.	Feeding and WIC programs downsize as access to healthy foods improves, incl. expansion of SNAP benefits per participant, and spread of urban gardening.
	particularly with extracurricular programs, to make schools the center of activity for kids throughout the year. VDH continues WIC and works with hospitals to	VDH facilitates services through automation. Federal funding of Child and Adult Care Food Program and Summer Food Service Program eliminated by 2018.	Expands partnerships to all 120 school systems, particularly with extracurricular programs, to make schools the center of activity for kids throughout the year.
	make breastfeeding the cultural norm.	Maintains presence in some school systems.	Non-profits, faith-based, and other organizations increase efforts on community nutrition, incl. community gardening.

	Scenario #1	Scenario #2	Scenario #3
	VIRGINIA	DEPARTMENT OF HEALTH (VDH)	
Health Equity and Minority Health	Health equity focus is institutionalized throughout VDH and across administrations. Infant mortality and vaccination goal is shared across VDH, though regional disparities persist. Provides tools, training, technical assistance to health districts for community engagement; continues raising health equity awareness. Looks for gaps and facilitates actions to close those. Assures that everybody has a quality medical home or access to telemedicine, automated translations or medical interpretations. Rural health challenged the most with provider supply issues, despite health reform; telemedicine improves yes doesn't close the gap. Focuses on policies and making sure that decision-making and planning is truly inclusive of all stakeholders.	Health equity loses funding; remains a commitment but VDH can do little. Social, economic, and environmental conditions all increase health inequity in the state. Rural health office loses its funding as well.	Health equity focus is institutionalized throughout VDH, state government, the public. Integrates health equity lens into Healthy Virginia goals and metrics, licensing and credentialing, and regulation activities conducted by all state government agencies. Provides tools, training, technical assistance to health districts for community engagement. Looks for gaps and facilitates actions to close those. Assures that everybody has a quality medical home or access to telemedicine, automated translations or medical interpretations. Focuses on policies for inclusion for community engagement making sure that decisionmaking and planning is truly inclusive of all stakeholders.