Future of Public Health Work Group

Investments and Capabilities Needed for the Future Public Health System

September 2021

This work aims to provide a fact base and assessment of current and future trends to inform any public health system initiatives that might be needed to address recent challenges and to prepare the state of California and its residents for a healthier future.Research to inform perspectives in this report included more than 60 analyses, discussions with stakeholders, jurisdictions, city, county and state surveys, and expert interviews across a broad range of topics.

This memo is meant to synthesize insights based on currently available and collectedinformation and does not unanimously represent the recommendations of all stakeholders. The memo does not represent the direct views of the California Department of Public Health.

Acknowledgements

This memo was authored by the *Future of Public Health Workgroup* to outline the aspiration for California's public health system and prioritize capabilities and investments needed to reach thisaspiration. This memo describes investments in a set of core functions that are cross-cutting and underpin the work of state and local public health departments. The contents of this memo are intended to help shape a budget proposal for inclusion in the 2022-23 Governor's Budget. The following individuals, organizations, and agencies contributed their time and valuable insight and expertise to this memo.

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1.0 Executive Summary

1.1 Context

The main role of our state public health department is to protect and promote the health of all Californians in all communities. (Exhibit 1: Example responsibilities of state and local governmental public health). State and local governmental public health also work to communicate effectively to inform and educate people about health, ensure the safety of food and water, reduce smoking, prevent chronic diseases and conditions like diabetes, cardiovascular disease, cancer, asthma and obesity and ensure patient safety in hospitals and other healthcare facilities (state public health). The focus of these efforts is to ultimately **protect communities, promote healthy behaviors, and prevent disease, disability, and premature death**.

Exhibit 1: Example responsibilities of state and local governmental public health

Over the last 14 years, during which over 200 programs and countless emergency responses were delivered, public health has played a pivotal role in improving the health and well-being of California communities (see examples to the right)[1].

In the last 18 months, the role of state and local governmental public health has been further magnified by the response to COVID-19. As the pandemic took hold, public health had to simultaneously maintain core responsibilities and engage in an emergency response at a scale never experienced before. This required a multi-pronged approach: rapidly expanding and improving surveillance and immunization data systems; identifying and establishing a PPE supply chain and repository; building and expanding a massive testing capacity; developing lab sequencing and data infrastructure to track variants; scaling and conducting disease investigations and contact tracing; issuing clear and comprehensive public health non-pharmaceutical interventions, orders, and guidance to a large and diverse population, and distributing vaccines swiftly and equitably.

Through this work, California's COVID-19 response has been successful across several measures. It was among the first 15 states to reach the national target of 70 percent of people with 1+ dose of a vaccine, and as of August 19, has administered more vaccine doses than any other state—46 million doses compared to next highest state with 28.9 million doses.[2] California is also among the top 6 states when ranked by volume of daily tests conducted per population and was also the first state to use a metric that addressed health equity as a criteria for reopening counties.[3] At the height of the response, the state was able to process 9 million tests per month while maintaining an average time from administering tests to reporting the results (turnaround time) of fewerthan 48 hours.[4] Lastly, California established a first-of-its-kind genomic sequencing network capable of conducting over 10,000 sequences a day to detect variants.[5]

However, the state's COVID-19 response exposed new challenges and brought several existing issues to the forefront, including: health equity concerns with racial/ethnic and socio-geographic disparities in cases, hospitalizations, and deaths;[6] maintenance of regular operations when more than 1,500 and local state staff were redirected for COVID-19 response (e.g., public health activities such as tuberculosis screening stalled, straining the ability to maintain local public health activities);[7] implementation of testing, contact tracing, and vaccine infrastructure with insufficient historical investmentfor

Examples of the impactof California's public health system in recentyears

- Achieving the 2nd lowest smoking rates in the country due to smoking cessation policy, programs, and education
- Reducing infant mortality rates to the 5th lowest in the country (4.06 deaths per 1,000 births) through maternal and child health programs including nutritional support and genetic disease screening
- Building capacity to conduct over 200,000 PCR tests per day through its 30 public health laboratories
- Establishing vital records infrastructure that manages records for over 450,000 births and 250,000 deaths per year
- Promoting safe restaurants and eating establishments through over 200 thousand inspections per year

current needs; and the difficulty of using outdated, under-resourced and decentralized current IT systems and capabilities, which at times hampered the state and local government's ability to manage the volume and dynamics of dealing with a pandemic caused by a novel virus.[8]

These challenges are particularly pressing, given communities across California are seeing increases in the number and severity of emergencies, communicable disease outbreaks, and rising rates of chronic health conditions in an aging population; the public health infrastructure is eroding and threatening the public's health. These trends will put increasing pressure on the scale and intensity of needs to which state and local governmental public health will need to respond:[9]

- **Growth in the prevalence of mental and behavioral health challenges among adults**—from 2014–2018, the number of Californian adults who reported experiencing serious psychological distress increased by **42 percent**[10]
- **Growth in the scope and severity of communicable diseases**—vaccine-preventable disease cases have increased by **38 percent** across all California counties in the last decade[11]
- **Rising rates of chronic health conditions in an aging population** will continue to be the leading causes of death in California—**9 of the top 10** causes of death were chronic diseases or injuries in 2017[12]
- Warming temperatures, exacerbating the risks of **heat-related cardiovascular, respiratory, and cerebrovascular disease** and **increasing transmission of diseases** such as West Nile and Valley Fever[13]—summer temperatures are expected to increase by **2.6 degrees Fahrenheit** every decade[14]
- **Wildfire risk** is expected to increase, contributing to **respiratory issues** and increasing the risk of **cancer, heart attacks, and strokes**—the number of days of high wildfire risk a year is expected to increase from **125** to **140+** by 2050[15]

The ramifications of not adequately addressing these public health challenges will impact the quality of life for all Californians. A modern and robust governmental public health system ensures critical protections and prevention measures are in place, and that the public health system is prepared to respond and adapt to the ever-changing landscape of issues affecting the public's health. From an eco-social perspective, interventions that public health is uniquely positioned to design and deploy could also drive economic benefit for the state to provide $6 for every $1 invested in improving health (e.g., by preventing premature deaths, reducing potential disability in the labor force, or enabling people to stay in the workforce longer and more productively).[16]

1.2 Funding to date

"The nation's public health system is seriously underfunded, and this lack of investment puts Americans' lives at risk. The impact of this historical underinvestment gets worse each year as the range and severity of health security threats continue to grow"

(Trust for America's Health, April 2020)[17]

COVID-19 has renewed the attention on the level of scrutiny of public health funding. Two historical funding limitations (funding has plateaued and remains sequestered in categorical programs), if left unaddressed, will make it difficult for California to rise to the challenges outlined above. The issues facing California in the coming decades are new, different, and on a scale not seen before. Addressing these will require a different mechanism for funding that could enable the state to advance a public health system capable of meeting future challenges that are likely to be pervasive (and not disease / condition / program specific) and to profoundly affect both the life expectancy and quality of life for all Californians. (Exhibit 2: Public health funding by stream—summarizes sources of California public health funding)

First, state and federal public health funding had plateaued prior to COVID-19. In the last decade, funding for public health departments has dropped nationally by 16 percent and public health departments have lost a quarter of their workforce over the same period.[18] In California, an average of 54 percent of California's public health budget relies on federal funding,[19] however, in absolute terms this amount is lower compared to other states. As of 2019, California is ranked 43rd in per capita program funding from the CDC.[20]

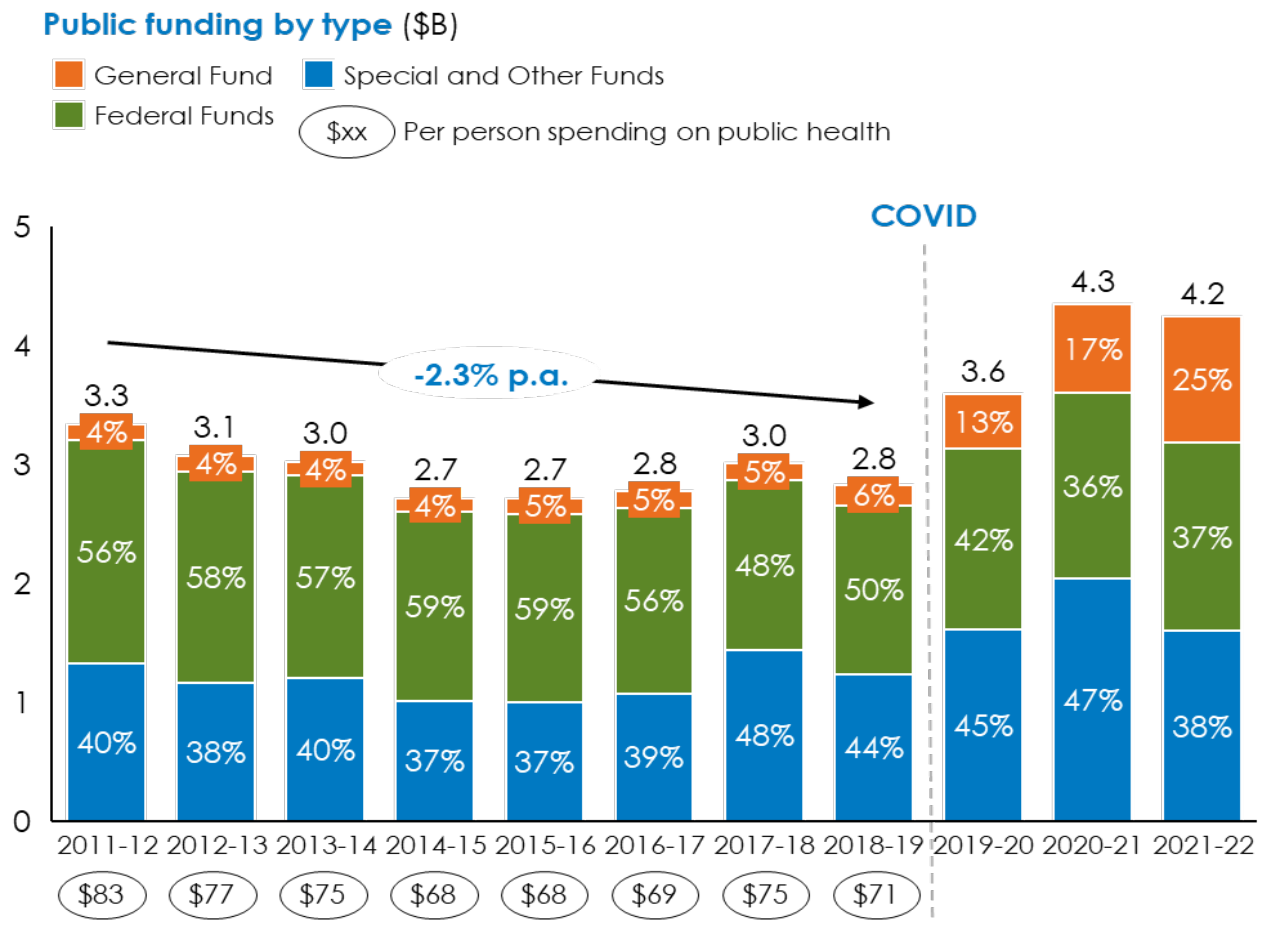
California's state funding for public health prior to the COVID-19 pandemic had also plateaued in spite of efforts to increase funding (e.g., for public health infrastructure). Public health was allocated $3 billion, about 2.8 percent of the $119 billion state budget, when it was formed fourteen years ago. In 2018-19 fiscal year, the allocation had declined slightly from 2004 in dollar terms, representing 1.4 percent of the $201 billion state budget [21], compared to a nationwide average of 2.7 percent.[22]

Over time these factors have taken California's per capita spending on public health from $76 per person to $71 per person (2018-19).[23] Comparatively, this puts California in the bottom 50% of states in term of per capita public health spending[24] (Exhibit 3: Annual average public health expenditure per person).

Second, available funding is largely categorical, offering little flexibility to meet changing public health needs or fill gaps in existing programs. During emergencies that required pivots in focus areas, as was experienced with H1N1, Zika, and COVID-19, California's state and local governmental public health has relied on the federal government or the state legislature for emergency supplemental resources.[25] Even this supplemental funding usually takes the form of large infusions earmarked for a particular challenge, which create short-term, limited resources and hiring difficulties for full-time staff. While these funds can be used to deal with the specific emergency, supplemental funding is typically not fungible and so cannot be deployed for longer-term planning to prepare effectively for future public health needs. Together these factors have driven fragmentation and put constraints on the state and local

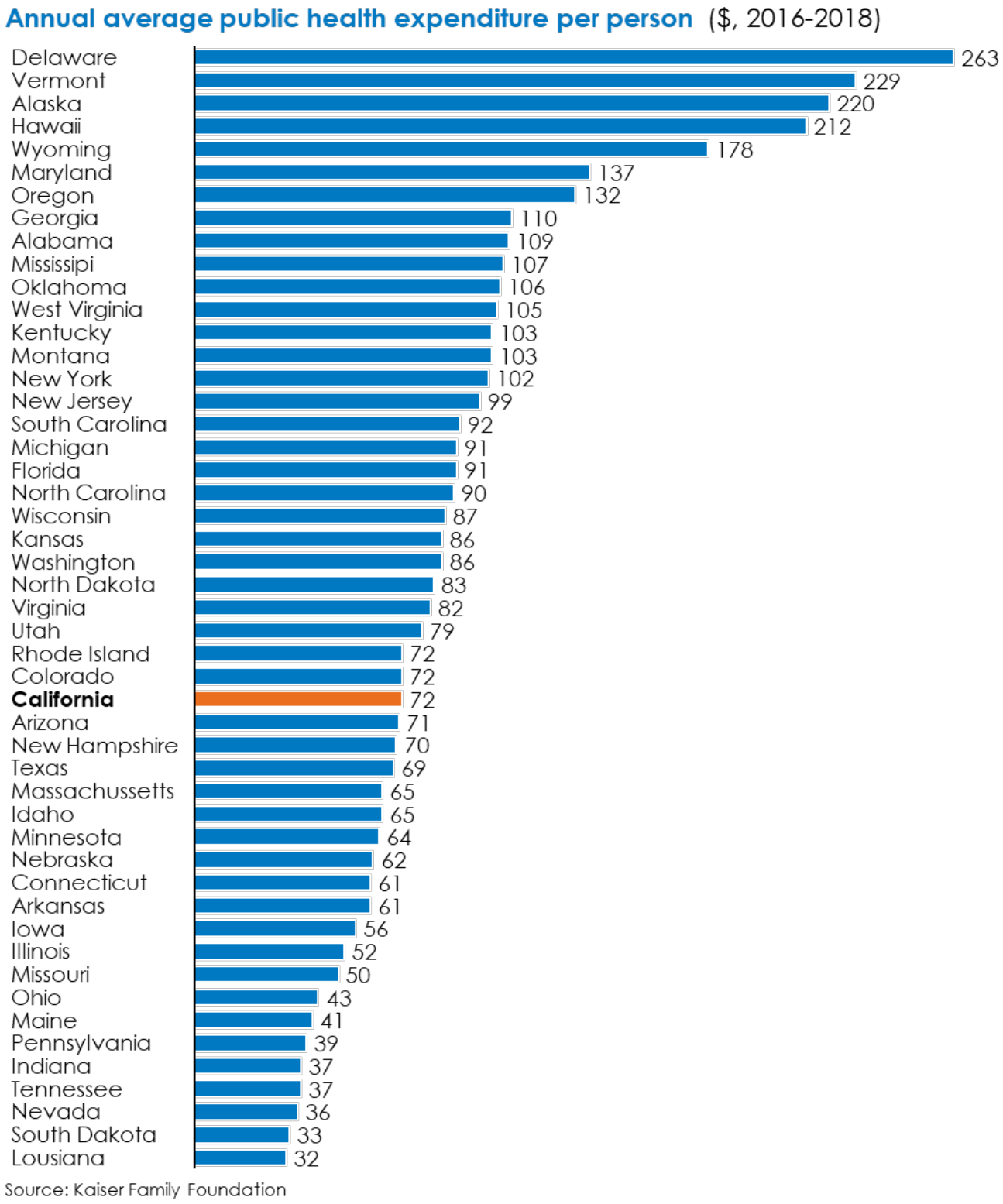
governmental public health's agility, flexibility, and capacity to scale quickly. The issues facing California in the coming decades are likely to be new, different, and on a scale not seen before. One-time supplemental funding continues to be too little and often too late and adds band-aids rather than healing at the source of the wound. Rebuilding the state and local governmental public health infrastructure in California will require stable, flexible funding, with multi-year spending authority, to meet the diverse and changing public health needs. Addressing these issues would require a different mechanism for funding that could enable California's public health infrastructure to meet the challenges of the future, not just the known diseases, conditions, or programs of today.

Exhibit 2: Public health funding by stream



Source: California Department Finance, 3-Yr Expenditures and Positions for each year.

Exhibit 3: Annual average public health expenditure per person



1.3 Methodology to determine investment areas

The Future of Public Health Work Group's aspiration is that **Californians, working together, can enable all to live happier, healthier, and longer lives by closing the gap in life expectancy by 50 percent and reducing the disease burden by 15 percent within the next decade.**[26]

Achieving this aspiration—both in totality, and equitably across populations—would require a transformation beyond any specific public health programs or disease area. **Rather, state and local governmental public health would need to be able to intelligently anticipate the needs ahead; act as a catalyst to mobilize partners to take action; reach all Californians where they are, geographically and culturally; and attract, train, and empower a diverse workforce.** Investing in these areas would provide California with the agility, flexibility, and scalability to respond to the known and unknown public health challenges of the future.

To catalyze this change, six foundational governmental public health services were identified by California public health leaders. These are considered to be core public health services that are cross-cutting and underpin the work of state and local public health departments. Governmental public health services are a vital part of the larger health ecosystem, which includes a broad set of stakeholders such as the healthcare delivery system, community-based organizations, academic institutions, regional coalitions, philanthropy and many others. While recognizing the multiple stakeholders involved in improving the health of communities, families, and individuals, the focus of this effort was on the core *governmental* public health infrastructure requiredto empower state and local government public health to mobilize and operationalize public health goals with a broad range of partners. Moreover, the six specific foundational governmental public health services identified here would allow for a shift from a categorical and case-based (individual) approach to an eco-social, life course model (Exhibit 4: Framework for a 21st century public health system).

Exhibit 4: Framework for a 21st century public health system

Programs	Behavioral Health	Communi-cable Disease Control	Chronic Disease and Injury Prevention	Environ-mental Public Health	Maternal, Child, and Family Health	Access to and Linkage with Clinical Care
Foundational governmental public health services	**Workforce development, recruitment, and training:** Capacity and ability to recruit, retain, and develop a diverse workforce					
	Emergency preparedness and response: Capacity to respond to emergencies of all kinds, from natural disasters to infectious disease outbreaks to bioterrorism					
	IT, data science, and informatics: Ability to track, derive insights, and take action based on community health data					
	Public education, engagement, and behavior change: Ability to effectively communicate to diverse public audiences with timely, science-based information					
	Community Partnership: Ability to harness, work with, and lead community stakeholders and to create multisector collaborations to address public health and health equity issues					
	Community Health Improvement: Ability to scale public health from health promotion to a comprehensive community health strategy that emphasizes life course approaches, equity and prevention					
Foundational principle	**Performance management:** Ensuring equity, efficiency, and effectiveness					

Source: Future of Public Health Workgroup

The *Future of Public Health Workgroup* brought together local health executives, health officers, administrators, and administration leadership to develop a framework for California's 21st century public health system and identify core infrastructure foundational governmental public health service investments capable of meeting current and future public health needs. Throughout the process, a broad array of state, county, city, and association stakeholders—as well as existing advisory boards—were engaged to provide input and shape recommendations *(see Acknowledgements)*.

Each of the six foundational governmental public health services identified were subjected to an intensive review process using a four-phase approach:

- **Phase 1**: **Align on needed capabilities and baseline.** To ensure a comprehensive assessment, the *Future of Public Health Workgroup* adapted capability frameworks from the Centers for Disease Control and Prevention (CDC), Centers for Medicaid and Medicare Services (CMS), deBeaumont Foundation, and Healthcare

Information and Management Systems Society (HIMSS), among others, for each foundational governmental public health service. These frameworks incorporated perspectives on the capabilities that will be needed to address key future trends affecting public health. Using surveys and focus groups, capabilities of local health jurisdictions and the state were assessed against the capability framework to baseline the current state and identify pain points.

- **Phase 2: Identify needs for the future state.** The *Future of Public Health Workgroup* defined the needs for the future that would enable the state to achieve its overall aspirations. The needs were informed by learnings from the pandemic, as well as capabilities of other states and jurisdictions that had made systematic investments to advance public health.
- **Phase 3: Identify initiatives to fill the gaps.** Multi-disciplinary sub-teams were formed for each foundational governmental public health service to define a set of initiatives that could close the capability gaps between the current state and the future state aspiration. These initiatives were validated by stakeholders including the Health and Human Services Agency, external boards, and health officials, and were further refined by modeling the output against best-in-class examples from local health jurisdictions (LHJs), other states, countries, as well as private and social sector organizations.
- **Phase 4: Size the potential range of investment for each initiative.** A mix of techniques were used to translate initiatives into potential costs. These included using both external and California benchmarks, and scaling current expenditures to encompass the new scope. All cost range estimation approaches are intended to show a gross, incremental cost to deliver the new initiatives described. No account has yet been taken to redirect existing funds or utilize other investments.

1.4 Summary of shifts across foundational governmental public health services and associated investments

The process described above highlighted the opportunity for fundamental shifts across each of the six foundational governmental public health services that would likely be necessary to effectively address the challenges ahead.

Much of the near-term focus for California's state and local governmental public health would be around building a robust workforce, including a particular focus on emergency preparedness, data and analytics, and administration. An expanded workforce, with the capabilities and diversity of talent required needed to meet California's aspiration, would help facilitate effective delivery across other foundational governmental public health services. An always-ready and sustainable emergency preparedness infrastructure would build on lessons learned during COVID-19 to ensure that California's broad public health priorities are executed on even during times of crisis. A tech-enabled data and analytics capability would provide visibility to track impact and continuously improve public health services. With these immediate areas of focus, California's state and local governmental public health can also build towards a holistic partnership network, proactive and culturally and linguistically competent communications and comprehensive community health improvement strategy, increasing capabilities across all six foundational governmental public health services.

Estimated annual costs associated with these shifts would increase California's **public health expenditure by 20-23 percent, changing per person spending on public health from $71 to $89-$92.5** (assuming pre COVID-19 budget of ~$3 billion a year and population of 40 million). This per person spend is still less than other ambitious states such as New York (average per person spend of $102 on public health).[27]

Foundational governmental public health service 1 – Workforce

A diversified workforce empowered to build an equitable, efficient, and effective future public health system

California's public health workforce is charged with a broad and demanding range of responsibilities— transforming data into actionable insights, performing advanced analytics, conducting disease outbreak investigations, regulating healthcare facilities, implementing long-standing public health programs, and effectively communicating public health guidance to promote healthy behavior among a diverse population. However, considering the aspiration for the future, it is currently understaffed, and the workforce under-equipped, to execute on the tasks before it. The state's roughly 20,000public health workers, across CPDH and local health jurisdictions, report being overstretched by the response to the COVID-19 pandemic. They cite limited career pathways within the complicated job classification system and pay as top issues impacting retention.[28] With increasing workforce costs and declining funding, state andlocal health departments have often struggled to attract the highly specialized talent needed to harness cutting-edge technical and technological advances in public health, and to diversify its talent pool to better reach, serve, and reflect all of California's communities. This difficulty has been further exacerbated by the aging workforce (e.g., 61% of state-level managers/supervisors are reported to be eligible for retirement), as well as tenuous labor patterns .[29] In addition to operating effectively during times of" steady state," this public health workforce must also have the flexibility,capacity, and cross-cutting competencies to mobilize and respond to acute emergencies, be they large infectious disease outbreaks or natural disasters.

To respond effectively to the next set of public health challenges, California's state and local governmental public health system will need to be able to:

- **Attract a diverse and talented workforce** -- that has the relevant skills and experiences, and that reflects the communities they serve -- to bolster capacity at the state and local level
- **Create opportunities** to grow and develop its current and future employees into leaders
- **Implement a robust and agile talent model** to ensure the workforce is able to adapt to the state's changing public health needs, from data science, technology and disease surveillance to marketing and communications
- **Promote creativity, flexibility, and innovation** to ensure an effective and inclusive working environment and culture

Achieving this workforce vision would require two major investments: (A) funding to support the expansion of the workforce, filling known gaps to ensure there is sufficient capacity to deliver on the system demands, and (B) augmenting of the state and local workforce development capabilities required to attract, develop, and retain the public health workforce of the future. Across both dimensions, it would require a strong equity orientation —from the development of workforce pipelines, the design of job classifications, the organizational culture transformation, and the quality of training, to the data that the workforce management systems track.

A. *Expanding the workforce:* California's state and local governmental public health system would need to support the expansion of the workforce—both locally and at the state level—to create sufficient capacity and upskill expertise to meet the new demands on the system. Strengthening the systemwide workforce would provide strategic and operational bandwidth to augment central functions, address new and emerging health priorities (e.g., climate change, built environment) and enhance ability to respond during times of crisis. To understand the optimal staffing levels across these role categories and others, the *Future of Public Health Working Group* drew on three sources of insight: a CDPH and LHJ capabilities assessment, external research and national reports from the National Association of County and City Health Officials (NACCHO) and Association of State and Territorial Health Officials (ASTHO), and interviews with subject matter experts. Based on this assessment, it is expected that the governmental public health system would need to augment the **systemwide workforce with an incremental ~1,900-2,300 full time employees,** (~10-12 percent increase from the current workforce) to build capacity and capabilities across identified core public health infrastructure needs, including:

- Targeted technical expertise (~20-25 percent of total incremental workforce) including epidemiologists, lab scientists and emergency preparedness staff
- Central functions (~25-30 percent of incremental workforce) for operational needs including human resources, administration, legal, and fiscal operations
- Executive management, project management and strategic planning (~10 percent of total incremental workforce) to provide executive leadership (e.g., strategy and planning, clinical expertise), as well as project management capacity to stand up new programs
- Communications, education, and community partnerships (~10 percent of total incremental workforce) to increase accessibility of public health information and reach communities effectively
- Data Science and Information Technology (~10 percent of total incremental workforce) to support new capabilities in data analysis and decision science, as well as critical IT enhancements needed as California's public health system moves towards implementing sophisticated and data-enabled networks
- Other roles (~15-20 percent of total incremental workforce) across core public health areas such as equity-dedicated staff, vital records, and other program specialists

This incremental FTE assessment was developed to understand potential systemwide needs based on currently available information and is not intended to recommend allocation decisions. Furthermore, given the variation in public health program offerings and responsibilities (e.g., environmental health, animal control, vector health), currently available resourcing and current workforce role categories and competencies, as well as the diversity of populations in each jurisdiction, further LHJ-specific analysis may be needed to assess specific hiring priorities for each LHJ.

B. In order to attract incremental new hires, as well as develop and retain the existing workforce, California's state and local governmental public health system would also need to augment workforce development capabilities through a series of initiatives:

1. Standing up a **multi-channel, proactive, and digitally enabled recruitment and hiring function,** including offering competitive salaries, to attract top talent that reflects the diversity of California's population.
2. Creating a **simplified, aligned job classification system within CDPH** that can be utilized as a model for LHJs —reducing and replacing the number of existing classifications with defined classifications, as well adding new classifications that reflect evolving public health needs—with broadened role definitions that enable defined career pathways and have minimum requirements that capture not just credentials, but also the lived experience of potential talent.
3. Undertaking a **holistic organizational culture transformation at CDPH and at the individual LHJ level** to ensure inclusiveness and support employees (e.g., developmental support, career pathways, sufficient staffing), incentivizing them to stay and grow into leadership (using both salary and non-salary levers).
4. Building a **culture of growth and learning via a well-structured, up-to-date, and highly accessible training program** in partnership with leading schools to provide employees with cross-training, upskilling, and apprenticeship opportunities for both technical and soft skills (e.g., core public health 101, leadership skills), with tailoring by role and capability.
5. Establishing a **comprehensive competency-based performance management system** to define necessary competencies across public health roles, assess gaps in skillsets, and track competency development along career progression pathways.
6. Standing up an **operational planning function** to develop staffing benchmarks, ensure minimum recommend staffing standards are met across prioritized roles for CDPH and LHJs, and support agile, strategic workforce deployment based on indicated needs (e.g., surge deployment, resource sharing).

As people both within CDPH and the LHJs are the lifeblood of the public health system, it would be imperative to continue to maintain an organizational health and equity orientation across the system—engaging CDPHs' and LHJs' frontline workers and pipeline candidates for input and direction in shaping the workforce and its development.

Foundational governmental public health service 2 – Emergency preparedness and response

"Ready and sustainable" structure that can rapidly identify hazards and deploy

California has a long history of natural disasters and communicable disease outbreaks due to its vast size, geographic variation, and large population. Beyond COVID-19, the frequency and scale of hazards in California has increased—public health has remained in active response for nearly 90 percent of the last 3½ years, covering more than 120 different emergencies.[32] These emergencies have impacted many of the communities most in need (e.g., communities in lowest Healthy Places Index quartiles [33] have experienced 70 percent of COVID outbreaks),[34] and have triggered downstream public health repercussions (e.g., the Camp wildfire triggered severe asthma leading to the use of new prescription medicine)[35]. Public health has an important role to play in engaging and expanding the group of stakeholders such as community leaders, business owners, and elected officials.

However, in the face of this constant response mode and expanding expectations, the emergency preparedness and response budget allocated by the state has decreased by 19.5 percent from 2007-2019 (approximately 21 million dollars), which has often led to strained capacity with limited resources to identify early hazard warning signals (e.g., local public health labs have decreased from 41 to 29, lab funding has been stagnant for 10 years, complicating infrastructure maintenance demands and staffing shortages).[36] These funding challenges have also limited capacity to plan ahead for new hazards, maintain regular public health operations during a response, or actively conduct community recovery.[37]

State and local governmental public health has outlined an opportunity for California's public health system to take an "all hazards" approach to Emergency Preparedness with an aspiration to impact life expectancy and community and responder resiliency by:

- **Ensuring early detection** of infectious, biological, chemical, environmental, and radiological agents to prevent adverse impact, and taking the time to identify a hazard to within a day from 7-14 days currently
- **Improving the timeliness of response** to threats (e.g., development of interventions and communications to stakeholders and the public), and taking the average time to respond to a hazard to as close to real-time as possible from 24-48 hours currently[38]
- **Addressing inequities** by developing nimble interventions for groups experiencing disproportionate impact
- **Sustaining regular public health operations** across the system while engaging in an active response, including ensuring continuity of local emergency preparedness operations and taking the number of redirected state emergency preparedness staff during a hazard event from 85 percent to dedicated teams responsible for preparedness and response activities.

Several initiatives were identified to build preparedness and response capacity:[39]

1. **Developing a 24/7 intelligence hub** focused on proactive and real-time hazard detection. With the use of analytics and dashboard functionality (leveraging public health and non-public health data), state and local governmental public health would be able to maintain situational awareness at the city, county, regional and state level as well as proactively identify emerging threat and activate response protocols timely. (Note: additional needs for laboratory resources are accounted for in the workforce foundational service section)
2. **Supporting planning, training, and tabletop exercises** by establishing a dedicated 'core team' that is able to refresh plans (with tactical references such as field guides and playbooks for different types of hazards) and test them through regular training and exercises even during response periods. This effort would allow for more agile and timely response to hazards.
3. **Building a regional resourcing model to support critical emergency preparedness capabilities** such as health officer, public information officer, and disaster specialist roles to coordinate efforts for preparedness and response.
4. **Establishing a Public Health Reserve Corps** consisting of ~1,000 public health volunteers trained centrally but managed and deployed locally in the event of a large hazard event.
5. **Establishing community recovery units** to set community recovery guidance and ensure efficient cost recovery (e.g., FEMA reimbursements). As COVID-19 passes, ensuring public health's contribution to the multidisciplinary effort of helping communities minimize the impact of social, economic, and physical and mental health impacts will be paramount.

Foundational governmental public health service 3 – IT, data science, and informatics

Expanded data access and interoperability to enable data driven decision making and advanced analytics to explain, predict and prevent disease spread

California's public health system collects data on a variety of different risk and protective factors and health outcome measures, including communicable and non-communicable metrics for surveillance, monitoring, early detection, investigation, and response. However, data collection is fragmented across more than 200 programs—specific approaches are narrow in focus and inhibit efficiency, interoperability, and granularity (e.g., city health jurisdictions are unable to see data for populations within their purview).[41] The reliance on manual and paper-based reporting exacerbates the problem,[42] as does the use of a legacy IT infrastructure that at times, may limit scaling and flexibility.

Effective IT, data science, and informatics can help not only empower the public health workforce and improve their experience, but could also enable California's state and local governmental public health to be a leader in:

- **Building decision intelligence capabilities** to analyze data and information using modern data science to inform and optimize decisions, solve problems, and improve performance. Analytic competencies include description, prediction, causal inference, simulation, and optimization.
- **Responding quickly and effectively** to evolving public health circumstances (e.g., using forecasting and scenario analysis to determine appropriate public health measures during a disease outbreak)
- **Conducting retrospective assessments** following public health events and assessing and evaluating the impact of policy on decision making (e.g., using data science to evaluate the long-term benefits of immunization programs)
- **Using technology to engage partners and the community** to increase participation in public health and help policymakers assess the impact of policy and interventions (e.g., using mobile applications to facilitate timely two-way public health communication with communities, or working with the community to avoid data algorithmic biases)

Such an agenda could be enabled by the operationalization of systems with the capacity to capture data quickly and share across the state in standardized way. Achieving this would require modernizing the IT infrastructure, consolidating and enhancing data within systems, standardizing existing data and acquiring new data to gain fresh insights, and upskilling talent to take advantage of innovative and best-in-class analytics techniques. Initiatives necessary to meet this aspiration could include:

1. **Building a flexible and scalable backbone for dynamic public health activities**, usingcloud based, secure and scalable platforms needed for data sharing and management. Currently, only 20-30 percent of public health infrastructure is cloud based, limiting state and local governmental public health's ability to collect, manage, and make accessible the large amount of information (e.g., cases,

immunizations) needed for situational awareness and action. A cloud-based infrastructure would also allow for secure, wireless, and mobile access to information that better parallels modern workstyles. A dependency for realizing this initiative would be access to broadband for local health departments (city and county).

2. **Streamlining data in disease surveillance and licensing systems to create one-stop shops for disease and environmental surveillance information**. Currently, public health data within CDPH exist across multiple systems limiting interoperability and standardization. By combining and consolidating multiple, currently siloed, and standalone disease, environmental, and licensing systems, CDPH could standardize the most important pre-existing data while maximizing interoperability and operational efficiency.
3. **Enabling more efficient public health business processes and reducing manual burden** to not only facilitate more efficient tracking (e.g., grants, partnerships, and funding tracking) but also impact assessments (e.g., impact of hiring efforts, quality improvement efforts of programs). Redesigning these business processes could reduce manual burden through self-service capabilities, improve data transparency, allow for the use of technologies such as artificial intelligence to be responsive to inquiries from the public (e.g., businesses, schools), as well as move to a paperless system (e.g., no more paper accessioning for public health laboratories).[43]
4. **Integrating and/or accessing up to ~50 new data streams to enable public health analyses** including EHR, social determinants of health, and environmental data for more comprehensive views of communities and populations, their needs, and how they interact with the built environment. A core capability of governmental public health is the collection of sufficient, timely, and high-quality data to guide state and local public health planning and decision-making. Ongoing and systematic collection of data is essential for identifying and addressing public health threats. Adding these ~50 new data streams identified by the *Future of Public Health Workgroup* serves the aforementioned purpose and parallels the CDC's 'One Health' agenda that recognizes the interconnection between people, animals, plants, and their shared environment.[44] These new data streams could enable state and local governmental public health to take timely action for communicable disease and emerging threats, guide policy for chronic, behavioral, and environmental factors, and more closely link with the healthcare delivery system.
5. **Enhancing systemwide data governance and standards.** Several local public health agencies have reported a limited ability to access quality, timely, and actionable data for decision and policy making,[45] which underscores the need for data governance to develop a systemwide framework for the quality, standards, stewardship, processes, and technologies for managing the immense amount of data generated in public health. Such governance efforts can typically bring together stakeholders to propose specific recommendations on how to improve data quality, build shared data definitions, ensure appropriate access while meeting or exceeding appropriately high security standards, prioritize data acquisition efforts and raise the level of data literacy across the state and local governmental public health system.

6. **Building analytics workspaces to query data, run, iterate, and share models on key public health use cases.** The ability to the use data and epidemiology to evaluate the impact of public health policies is a foundational governmental public health capability. The analytics workspaces could allow various public health stakeholders to easily explore data and export reports; whether it be around descriptive analytics (e.g., hospital bed utilization and cases) to more complex analytics for predictive, prescriptive and causal interference use cases (e.g., use of advanced analytical tools to understand root causes of maternal and newborn mortality rates [46]
7. **Enabling access to accurate and timely data for city and county LHJs and stakeholders.** This initiative builds upon efforts to collect, standardize, and analyze data, by ultimately, democratizing the access and sharing of data to a broad range of local and academic stakeholders to guide state and local public health planning and decision-making. This would enable public health staff, such as epidemiologists, to focus on data analysis rather than data collection, while also accelerating the benefits of creating a statewide ecosystem of data sharing for public health.
8. **Building IT, data, and informatics capacity, skillsets and knowledge sharing to improve decision making** by hiring additional staff at the local level, establishing an Analytical Center of Excellence with regional and local capabilities, and upskilling existing staff through analytics training. This initiative would ensure that CDPH and local health departments have sufficient human resources to transform data into actionable information and perform advanced analytics. It would also enable public health staff to build their own capacity and capabilities to keep pace with technological advancements (e.g., in artificial intelligence and machine learning) to extract richer set of insights from public health data.
9. **Establishing an enterprise-wide IT, data science and informatics project management office** (PMO) to ensure successful delivery of these initiatives, as they build on each other. The PMO would play a coordination role to ensure the proper sequencing and orchestration of the initiatives, manage interdependencies, and ensure effective delivery.

Foundational governmental public health service 4 - Community partnerships

A holistic partnership network, engaged to support California's state and local governmental public health efforts

Public health services are a vital and unique function in convening and sustaining stakeholder partnerships. In California these community partners span a broad range of organization types, including but not limited to academic institutions, regional coalitions, private sector partners, community-based organizations, and philanthropists. Each of these partners can play varying, but critical roles in advancing the state's mission around public health (e.g., educating, supporting the provision of direct services, collaborating on governmental efforts on policy creation). As California redefines public health, there is an opportunity for the state and local public health governmental infrastructure to ensure the sustainment of existing partnerships and enablement of new partnerships. To date, partnership formation has not been uniform, with many partnerships stemming from crises -or being reliant on legacy partner networks that do not represent or serve all communities. To effect long-lasting change and health improvements, public health must be able to mobilize community partnerships to identify and solve problems, and to conduct community health assessments and interventions. Building a governmental infrastructure to support partnerships could expand the state's reach and ability to quickly and effectively serve populations most in need in a tailored way. This could ultimately push the public health system towards a culture of equity, antiracism, and health for all Californians.

Building this governmental infrastructure to support community partnerships in public health would enable the state and local public health systems to:

- **Engage a broad range of partners** in holistic and inclusive collaborations and use a data-backed approach to assess our existing relationships
- Enable a high level of proactive coordination with partners **so that partnerships can be mobilized as needs arise**
- **Tap into the power of coalitions** by strategically assessing the functions that community partners could take and activating them to play roles where they are uniquely positioned to have impact

California's state and local governmental public health aims to prioritize community partnerships that enable culturally competent engagement and help **promote health equity and foster trust in government institutions,** acknowledging that building this trust takes time. Four initiatives in the community partnership infrastructure were identified to help drive the shifts:

1. **Develop a community partnership strategy** to outline roles and intended capabilities of community partners in supporting California's public health mission. This strategy could help identify and support partners whose missions complement those of the governmental public health system and support the delivery of core public health services across California's communities, including partners of all archetypes (e.g., size, type, services provided, location).

2. **Hire dedicated community engagement personnel** to ensure personalized outreach and uptake of an overarching community partnership strategy (e.g., home visitation programs).
3. **Establish a community partner relationship management (CPRM) system** to achieve a broader outreach pipeline in local communities, strengthen existing partnerships, and address equity goals.
4. **Launch a CDPH public health community funding matchmaking infrastructure,** connecting community partners to appropriate funding sources and ensuring that funds are allocated to a diverse network of organizations through a dedicated team and system.

Foundational governmental public health service 5 – Communications and public education to promote healthy behavior

A proactive, personalized, and highly coordinated communication strategy andoperations

Communications and public education to promote healthy behavior are critical to delivering on a trust and prevention-based public health strategy in the future. The public health system aspires to effectively reach all Californians (including the general public, policy makers, media outlets, governmental public health employees) in a proactive, culturally competent, personalized, coordinated, and equitable manner. Effective communication and collaboration also include maintenance and ongoing relations with local and statewide media to develop and implement risk communications to the public. Given the vast number of sources Californians receive information from, it is crucial that the public health system is able to communicate effectively, including quickly identifying and debunking misinformation and meeting the anticipated demand for **diverse, proactive communications both in steady state and in times of crisis.** California's aspirations for the next decade include:

- **Effectively and equitably** driving systemic change that encourages healthy behavior and empowers Californians and other stakeholders to improve health and environment
- **Shifting public participation** from being informed and consulted to actively collaborating on public health priorities, when feasible, based on scientific evidence and in alignment with local elected leaders. Encourage professionalization of community members who are already taking the lead on public health (e.g., community health workers and volunteers)
- **Advancing health equity** by ensuring that all communications and public engagements are culturally competent and linguistically accessible
- **Promoting a shared narrative and vision** for improving public health in California that is rooted in core public health values and has the ultimate aim of building a culture of health and respect across the state
- **Ensuring all Californians have an equal voice** and the opportunity to shape the direction of public health activities
- **Engaging Californians at all levels,** including business communities, elected leaders, schools and other institutions

Two initiatives in communications and public education have been identified to help drive the necessary shifts:

1. **Creation of a core public health communications strategy** and a robust deployment plan which defines an overall public health narrative to promote healthy behavior and informs specific actions and priorities. This strategy would include a concrete organizational structure with clearly defined roles and responsibilities for various stakeholders, equity-focused understanding of population segments, omnichannel approach to deployment, and an annual process for goal setting and monitoring of results. In addition, California's strategy could include the formation of a strong

public health 'identity' that can be socialized by all stakeholders. The deployment plan would also evaluate which functions and activities would be supported with internal resources and which would require working with external partners.

2. **Ensuring operational capabilities and adequate capacity to effectively disseminate communications across a variety of channels** (including paid and earned media) and field incoming requests from Californians in a linguistically and culturally competent and linguistically accessible manner (e.g., high- and low-tech platforms, robust translation capabilities). Content could be cutting-edge and innovative, using human-centered design to effectively target population subsegments. To be effective, communications operations could include the capability to quickly digest new information and create a unified narrative that incorporates feedback and can be easily tailored by stakeholders for a variety of audiences.

Foundational governmental public health service 6 – Community health improvement

Comprehensive community health improvement strategy that emphasizes life course approach, resiliency, equity, and prevention

Community health improvement is a systematic approach that enables all people in a defined community to improve physical health and mental wellbeing through upstream prevention. Community health improvement efforts involve multiple stakeholders including public health agencies, philanthropy, education, the justice system, city and county governments, community development and housing agencies, state Medicaid programs, healthcare providers, businesses, and community-based organizations.[47] The overarching goal is to scale public health from health promotion to a comprehensive community health improvement strategy that emphasizes life course approaches, equity, prevention, and eco-social goals.

There are multiple examples of federal, state, and local efforts focused on community health improvement led by public health agencies. For example, the CDC has defined The Health Impact in 5 Years (HI-5) initiative that highlights multiple non-clinical, community-wide approaches to improve population health, including tobacco control interventions, early childhood education, and water fluoridation.[48]

Investing in community health improvement capabilities would enable progress toward the goals defined in the State Health Improvement Plan—from laying the foundation for a healthy life to preventing and managing chronic disease.[49] Additionally, state and local public health capabilities focusing on targeted community health improvement would help inform relevant efforts by the healthcare delivery system and other stakeholders (e.g., programs focused on upstream prevention and equity)

California's aspiration in community health improvement is to improve health across the lifespan and make community environments more conducive to being healthy and resilient. This could be achieved by:

- **Enabling systematic and comprehensive efforts focused on community health improvement**, from needs assessment, to targeted public health program design, implementation, and monitoring of outcomes
- **Effectively convening and collaborating with state and local agencies, upstream partners, providers, communities, and other stakeholders** that have a stake in community health improvement
- **Strategically directing efforts and resources to areas of need and importance**, addressing health behaviors and a broad range of health factors (e.g., environmental, socio-economic), reducing health disparities, and focusing on community-wide prevention and resiliency

Community health improvement focuses on data-driven approaches to identify needs and assess health risks. It requires having access to comprehensive and aligned data, advanced analytics (including cost-benefit and health outcomes analysis) and is dependent on a strengthened workforce.

Four initiatives were identified to help drive the desired shifts in capabilities. These initiatives would be aligned with the MAPP (Mobilizing for Action through Planning and Partnerships) framework and a community-driven strategic planning process for improving community health[50].

1. **A comprehensive community health strategy that emphasizes life course approach[51] to health and public health prevention.** To deliver on aspirations, state and LHJs would need to align on specific goals and priority focus areas for community health improvement efforts. Community health improvement strategy would be developed taking into consideration local context, needs, and the partner ecosystem.
2. **A dedicated community health improvement team.** The *Future of Public Health Workgroup* identified the need to dedicate resources to focus on community health improvement. A dedicated team comprising state, local, and regional workforce would improve the engagement and involvement of public health with the increased bandwidth to focus on community health improvement.
3. **Standardized and aligned community health data.** Setting standards on data formats, reporting requirements, accuracy, and security could help ensure that collected data is compatible and usable, a critical step to enable high-quality analytics focused on health equity. In addition, this effort would need to expand the datasets used to inform public health efforts by accessing and aligning additional data sources (e.g., human services programs, Medi-Cal, environmental data). Lastly, data visualization tools, dashboards to monitor community health trends, and analytics to conduct cost-benefit analysis would need to be in place to enable effective use of the available data.
4. **Community health improvement plans informed by community-driven health risk assessment model.** This model would use an aggregated dataset to assess community needs at a granular level and would be focused on equitable interventions to inform community-level program design. This model would require alignment on analytics algorithms that are centered around health equity and fully utilize the available datasets. Additionally, pre-set outputs from the model would be combined with in-depth understanding of local needs and strengths to inform community health improvement plans.

1.5 Accountability for impact

The changes proposed across the six foundational governmental public health services here are intended to be transformational. Recognizing the magnitude of this undertaking, an investment is included for a strengthened Office of Policy and Planning, which would be accountable for the effective and efficient use of funds and establishing clear and quantified performance targets for the initiatives listed above. In line with the broader aspiration for this investment, the Office of Policy and Planning would also build capacity for the forward-looking strategic leadership required for the system to better anticipate the new and emerging public health needs. To ensure accountability towards these objectives, the office would also be responsible for producing and disseminating an annual report with clear, measurable KPIs across thesenew foundational governmental public health services investments including clear and transparent milestones. This report would reflect both a progress update on the new investment areas and identify any important shifts in investments areas based on lessonslearned.

1.6 Conclusion

The investment in the core foundational governmental public health services represents a bold plan that envisions community-wide participation to allow the state to jumpstart and accelerate the journey to build a 21st century governmental public health system. It tests the bounds of conventional thinking to position the public health system to have the essential infrastructure[52] to prevent chronic and communicable disease, promote health, and prepare for and respond to both immediate threats and structural challenges to the health and well-being of those who call California home. In the upcoming decades, these challenges are likely to increase in scale, scope and severity while cross cutting a variety of environmental, behavioral, social, and physical domains. Without a concerted effort from California state and local governmental public health, many of these looming threats may fall through the cracks, unidentified and unaddressed. Modernization of the state's public health system has been a "tomorrow problem" for many years. Tomorrow has arrived.

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1 Results as of 2016 based on data from Center for Disease Control and Prevention; Centers for Medicare & MedicaidServices; U.S. Census Bureau;. Vital records statistic provided via CHISI

2 Oxford University, Our World in Data Coronavirus (COVID-19) Vaccinations web page (ourworldindata.org/covid-vaccinations?country=USA) August 19, 2021

3 Kaiser Family Foundation State Health Facts COVID-19 Testing web page (www.kff.org/other/state-indicator/covid-19-testing/?activeTab=map&current Timeframe=0&selectedDistributions=daily-tests-per-million-population&selectedRows=%7B%22 states%22:%7B%22all%22:%7B%7D%7D, %22wrapups%22:%7B%22united-states%22:%7B%7D%7D%7 D&sortModel=%7B%22colId%22: %22Location%22, %22sort%22:%22asc%22%7D)

4 California State Auditor Report web page (www.auditor.ca.gov/reports/2020-612/auditresults) Public Health is Exceeding Its Testing Targets but Contact Tracing Efforts Statewide areLagging.

5 California COVID-19 Testing Task Force COVIDNet web page (testing.covid19.ca.gov/covidnet), August 19, 2021. Estimates include capacity of Valencia BranchLab and network of local public health labs

6 For example, as of August 12, 2021, Latino people account for 54.9% of confirmed cases and 38.9% of the total California population; white people account for 21.1% of confirmed cases and 36.6% of the population. Tracking COVID-19 in California (covid19.ca.gov)

7 As of March 28, 2021, there have been 597 internal redirects, 477 formal redirects, and 437 additional redirects forcontact tracing alone resulting in total staff costs approaching $18 million. CDPH Public Health Infrastructure Team

8 California Reportable Disease Information Exchange (CalREDIE) -- is used by nearly all of California's local health officesto track disease data and transmit it between those local offices, laboratories, health providers and the state (CDPH). In August 2020, it was discovered that the system had been experiencing programs with incoming reports, resulting in undercounting of COVID cases (LA Times, August 7, 2020)

9 CDPH Fusion Center; State of our State, 2020

10 Mental Health America, https://mhanational.org/issues/state-mental-health-America, 2021"

11 CHHS Vaccine Preventable Disease Cases by County and Year web page, (data.chhs.ca.gov/dataset/vaccine-preventable-disease-cases-by-county-and-year/ resource/a7a4d868-f6d2-49c9-8a11-904c69a0e3a0), 2021

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13 California Climate Change Assessment, 2018 PDF (www.energy.ca.gov/sites/default/files/2019-11/20180827_Summary_Brochure_ADA.pdf)

14 California Office of Environmental Health Hazard Assessment (OEHHA) Vector borne diseases web page (oehha.ca.gov/epic/impacts-biological-systems/vector-borne-diseases),February 11, 2019

15 OEHHA Vector borne diseases web page (oehha.ca.gov/epic/impacts-biological-systems/vector-borne-diseases),February 11, 2019

16 "Prioritizing health: a prescription for prosperity", McKinsey Global Institute, February 2021

17 The Impact of Chronic Underfunding on America's Public Health System; Trends, Risks, and Recommendations, 2020.

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[25] Delays in Global Disease Outbreak Response: Lessons from H1N1, Ebola, and Zika; AJPH Perspectives, March 18

[26] Defined by CDPH leadership via working session on July 23, 2021

[27] KHN Hollowed-Out Public Health System Faces More Cuts Amid Virus web page (khn.org/news/us-public-health-system-underfunded-under-threat-faces-more-cuts-amid-covid-pandemic); Kaiser Family Foundation, July 1, 2020.

[28] CDPH Workforce Capabilities Assessment, July 29th, 2021

[29] CDPH Future of public health workgroup survey;" Meeting the Demand for Health; Final Report of the California FutureHealth Workforce Commission", February 2019; https://futurehealthworkforce.org/wp-content/uploads/2019/03/MeetingDemandForHealthFinalReportCFHWC.pdf

[30] Steady-state annual cost estimates do not include ~220 state FTEs associated with individual foundational governmental public health services; costs are accounted for within each foundational governmental public healthservice area (e.g., IT/Data, HR/workforce development, Communications, Community Partnerships, and communityhealth improvement).

[31] Numbers have been ranged to +/- 5% and rounded to the nearest $5M

[32] MHCC activation log

[33] The California Healthy Places Index (HPI), a powerful resource that showcases community conditions that predict lifeexpectancy and influence health. People's health is shaped dramatically by "non-health" policies and community characteristics, such as housing, education, economic, environmental, and social factors. These community conditionsare called the "social determinants of health", which inform the indicators used on the HPI platform. Public Health Alliance of Southern California

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47 Public Health and Population Health 101 PDF (www.astho.org/Health-Systems-Transformation/Medicaid-and-Public-Health-Partnerships/Learning-Series/Public-Health-and-Population-Health-101), Association of State and Territorial Health Officials (ASTHO), 2016

48 "Health Impact in 5 Years" PDF (www.cdc.gov/policy/hst/hi5/docs/hi5-overview-v7.pdf), CDC, 2017

49 Let's Get Healthy California web page (letsgethealthy.ca.gov/goals)

50 MAPP Evolution Blueprint Executive Summary, NACCHO PDF (www.naccho.org/uploads/downloadable-resources/MAPP-Evolution-Blueprint-Executive-Summary-V3-FINAL.pdf), 2020

51 A life course approach emphasizes a temporal and social perspective, looking back across an individual's or a cohort's life experiences or across generations for clues to current patterns of health and disease, whilst recognizing thatboth past and present experiences are shaped by the wider social, economic and cultural context. In epidemiology, a life course approach is being used to study the physical and social hazards during gestation, childhood, adolescence, young adulthood and midlife that affect chronic disease risk and health outcomes in later life. It aims to identify the underlying biological, behavioral and psychosocial processes that operate across the life span (Kuh and Ben-Shlomo, 1997).

52 Building a strong foundation of public health infrastructure web page (phnci.org/national-frameworks/fphs), 2021