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Rapid Review

Supporting the development of public health system performance indicators

Prepared for the Public Health Agency of Canada

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About

The North American Observatory on Health Systems and Policies (NAO) is a collaborative partnership of interested researchers, research organizations, governments, and health organizations promoting evidence-informed health system policy decision-making.

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List of Abbreviations

ACT	Australian Capital Territory
ASTHO	Association of State and Territorial Health Officials (US)
BC	British Columbia
CDC	Centers for Disease Control and Prevention
CPA	Community Partner Assessment (US)
EnvPHS	Environmental Public Health Performance Standards (US)
EPHS	Essential Public Health Services
FPHS	Foundational Public Health Services
FPT	Federal/provincial/territorial
NACCHO	National Association of County and City Health Officials (US)
NB	New Brunswick
NHS	National Health Service
NPHPS	National Public Health Performance Standards (US)
PHAB	Public Health Accreditation Board (US)
PHAC	Public Health Agency of Canada
PHDSC	Public Health Data Steering Committee
PHOF	Public Health Outcomes Framework (England)
PT	Province/territory or provincial/territorial
US	United States
WHO	World Health Organization

Executive Summary

A high-performing public health system depends on robust foundational structures, the effective and equitable delivery of public health programs and services, and results in population health improvements and reductions in inequity. While there is considerable activity in data collection and public health system performance measurement in Canada, particularly at the local/regional level, these may benefit from a more harmonized approach. The aim of this rapid review is to compare international approaches to public health system performance measurement to inform efforts in Canada.

A rapid literature review was conducted, supplemented with expert consultations, to identify and learn from public health system performance measurement approaches in three countries: England, Australia, and the United States (US). The analysis was guided by Donabedian's framework of quality care, encompassing structure, process, and outcomes, alongside definitions from the World Health Organization (WHO) and the Public Health Agency of Canada (PHAC) on the core public health functions. Key elements from the jurisdictional frameworks were mapped to Donabedian's model and essential public health functions to propose a framework, with illustrative indicators, for measuring public health system performance in Canada. Public health system experts and stakeholders across Canada, reviewed the framework and commented on potential indicators.

The review highlights diverse approaches to measuring public health system performance. All three countries prioritize health outcomes, though their frameworks differ in focus, format, and application. England's Public Health Outcomes Framework (PHOF) offers a comprehensive overview of health outcomes, focusing on improving health equity, and uses indicators reported at multiple administrative levels through an interactive web tool. Australia's National Preventive Health Strategy emphasizes long-term goals and health equity, aligning with existing national plans and frameworks, with public reports available and some interactive features regionally. Whereas the primary emphasis of the England and Australia frameworks are on tracking outcomes, including morbidity and mortality trends, and environmental and other determinants of health, in the US there is more focus on structures and processes to enhance public health systems. In the US, frameworks assess system performance at state and local levels, with limited comparability across the country. All three countries acknowledge the importance of adapting performance measurement to local contexts. Additionally, equity is emphasized across all frameworks, aiming to reduce and track health inequalities among various population groups.

The foundational framework for Canada proposed here draws on these three countries' approaches. It provides a consolidated structure based on Donabedian's model incorporating feedback from provincial and territorial (PT) representatives, featuring illustrative examples of concepts and indicators. Recommendations drawn from the reviewed frameworks include regular reviews and revisions of indicators, with input from a diverse range of stakeholders, including representatives from all PTs to ensure the framework's adaptability to evolving public health priorities and the ability to address specific needs at both national and sub-national levels. Emerging priority areas for consideration in a performance measurement framework were identified through expert consultations, including vaccinations, communicable and non-communicable diseases, and social determinants of health. Stakeholders also highlighted the importance of partnerships with Indigenous communities from the onset, Indigenous data sovereignty and transformation principles, feasibility considerations, intersectoral collaboration, and regular health equity reviews.

Introduction & Background

A well-functioning health system is tightly linked to effective public health interventions and their impact on population health and equity (1). Measuring the functioning of a public health system requires the evaluation of both the population's health outcomes and the system's capabilities, including resources and data systems. By "public health system" we refer to a collection of organizations with a primary mandate to improve population health through the core public health functions, including population health assessment, health protection, health surveillance, disease and injury prevention, health promotion, and emergency preparedness and response (2,3). Moreover, at the local level, public health units in Canada can be characterized as those responsible for delivering core public health functions for a defined population and being led by a medical officer of health (4).

Like Canada's broader health system, its public health system is composed of multiple local, regional, provincial, and national organizations and authorities that need to work together to achieve common goals. Provinces and territories (PTs) hold the primary responsibility for financing and delivering public health programs and services, with each jurisdiction outlining its public health objectives through its own legislation, regulations, and supporting policies and frameworks. The federal government plays an important role in Canada-wide coordination, financing and implementing programs addressing common interests, and managing international relations.

On February 7, 2023, the Government of Canada announced an investment of $196.1 billion over 10 years, of which $46.2 billion is new funding, for PTs to improve health services for Canadians (5). To access their share of the federal funding, PT governments were asked to commit to improving how health information is collected, shared, used, and reported to Canadians to promote greater transparency on outcomes, and to help manage public health emergencies. The Government of Canada intends to work collaboratively with PTs on four shared health priorities to improve integrated health systems for Canadians: 1) expanding access to family health services, including in rural and remote areas; 2) supporting health workers and reducing backlogs; 3) improving access to quality mental health and substance use services; and 4) modernizing the health system with standardized health data and digital tools. This funding includes an agreement to develop and use comparable indicators under the auspices of the Canadian Institute for Health Information (CIHI) and its data partners to enable comparable performance measurement across the country (6).

Current approaches taken to measure and publicly report on public health system performance vary across Canada and internationally (7,8). A recent report summarizing indicators used in the European Union (EU) found that the most commonly used indicators to measure prevention activities include cancer screening and vaccination coverage, with some consideration of lifestyle and risk factors as well as education and other socio-economic determinants (see **Appendix A**) (8). While there is considerable activity related to data collection and performance measurement in Canada, particularly at the local/regional levels, these may benefit from a more harmonized approach. The aim of this rapid review is to identify and learn from approaches to public health system performance measurement in three comparable countries—England, Australia, and the United States (US)—from which to develop a framework of illustrative indicators for measuring public health system performance to inform such efforts in Canada. This review complements the ongoing work by the Public Health Agency of Canada (PHAC) to enumerate and characterize Canada's public health system. Combined, these efforts can serve as a foundation for Canada-wide monitoring and strengthening of public health system performance.

Methods

Literature review

We conducted a targeted review and synthesis of existing literature (academic and grey) to examine public health performance frameworks and indicators used in comparable systems that adopt distinct approaches to national- and sub-national public health system performance measurement. Specifically, we examined the systems in England (but not other UK countries), Australia, and the US. We employed targeted searches on Google and Google Scholar using terms that included "frameworks to assess public health systems," examined reference lists of published materials, and sought recommendations from local experts. Data sources included publications from the European Observatory on Health Systems and Policies, government websites and reports, and academic publications.

Our analysis is grounded in Donabedian's model of quality of care (9), which provides a conceptual framework for evaluating healthcare service quality. This model focuses on three main components: structure, process, and outcomes. Structural measures evaluate factors such as financing, governance, workforce, physical facilities, and equipment that influence the delivery and capacity of public health programs and services (9,10). Process measures consider the delivery of public health programs and services across core public health functions, ensuring attributes such as high quality, equity, efficiency, safety, and responsiveness. Outcomes reflect the impact of public health efforts on communities, and populations, including changes in health status, reduction of inequalities, and satisfaction. We also consider whether these public health system performance frameworks explicitly addressed the application of essential public health functions and whether they integrated health equity objectives. Additionally, we note the jurisdictional level at which these frameworks operate and their consideration of geographical variations.

A summary of each country's approach to measuring public health system performance (see **Appendix C**) was shared with local experts (two per jurisdiction) for feedback, to address any information gaps, and to validate our summary descriptions of their respective jurisdictions. We identified experts as those who contribute to research or practice in public health system performance measurement in their jurisdiction. Experts were contacted by email to provide feedback and were invited to participate in a virtual meeting for additional clarification and discussion.

Framework Development

We developed a foundational framework for measuring the performance of public health systems in Canada. First, we mapped key elements identified in the three international jurisdictions to our expanded framework, including Donabedian's model of quality of care and essential public health functions (**Table 1**). We developed our proposed list of public health functions by consolidating PHAC (3) and WHO essential public health functions (2,11) with the WHO health system building blocks relevant to public health systems (12). Example concepts and indicators from the three jurisdictions were included to populate the framework. To ensure the robustness and practical applicability of our proposed framework to the Canadian context, we engaged public health experts and members of the Public Health Data Steering Committee (PHDSC). Public health experts were solicited to refine and enhance the framework, identify further potential indicators and corresponding datasets, and validate and assess the feasibility of selected indicators. We specifically asked members of the PHDSC to comment on indicators used in their jurisdictions based on criteria such as: a) comparability across local health units or regions; b) the extent to which they span structures, processes, and outcomes and to which they align with public health functions; c) whether they consider and measure equity; and d) the extent

to which they are publicly reported (see **Appendix B** for the list of questions and sample indicators included in stakeholder consultations with members of the PHDSC). The feedback provided by local experts and the PHDSC allowed us to identify emerging priority areas and considerations for the implementation of a national public health performance framework.

TABLE 1. Core public health functions, defined (13)

Public Health Intelligence	*Assessing the changing strengths, vulnerabilities, and needs of communities. Collecting health data to track diseases, the health status of populations, the determinants of health, and differences among populations.*
Health Protection	*Protecting populations from infectious disease, environmental threats, and unsafe water, air, and food.*
Disease and injury prevention	*Supporting safe and healthy lifestyles to prevent illness and injury and reducing risk of infectious disease outbreaks through investigation and preventive measures.*
Health promotion	*Collaborative work with communities and other sectors to understand and improve health through healthy public policies, community-based interventions, public participation, and advocacy on the underlying circumstances that shape health.*
Emergency preparedness and response	*Planning for, and taking action on, natural or human-made disasters to minimize serious illness, injury, or death.*

Limitations

The following overview of public health performance frameworks in England, Australia, and the US offers a representative snapshot, rather than a comprehensive depiction, with the primary aim to inform the development of a framework for the Canadian context. Thus, these descriptions may not fully capture all aspects of, or approaches to, public health system performance measurement in these countries.

Additionally, the list of concepts and indicators presented in our framework is intended to be illustrative rather than exhaustive. This list reflects our initial attempt to match indicators with the proposed framework, recognizing the potential for reclassification of indicators in the future. Where applicable, we included references to more comprehensive lists of indicators. Consequently, our compilation serves as a starting point, recognizing the need for a consultative and flexible approach to measuring public health system performance in Canada.

Lastly, we received feedback from nine provinces/territories (PT) representatives. The feedback focused on general impressions of feasibility related to the framework's implementation, equity considerations, with few mentions of indicators in use or relevant to their jurisdictions. Further consultations will therefore be needed to prioritize indicators for development and reporting in Canada, including with Indigenous partners to meaningfully integrate Indigenous data sovereignty and transformation principles into the framework and the approach to future data collection and reporting.

Summary of International Approaches to Public Health System Performances Measurement

We identified several frameworks designed to assess public health systems within the examined jurisdictions, which are summarized in **Table 2**. Though all frameworks include indicators to measure various aspects of the public health system, they differ in their format and applicability at national and subnational levels. England's Public Health Outcomes Framework (PHOF) (14) provides a comprehensive overview of health outcomes, with a focus on improving the health of the poorest fastest. PHOF indicators are reported at multiple levels (i.e., national, regional, and local) on the Fingertips interactive webtool (15), allowing for benchmarking and tailored strategies across different administrative levels. The latest version (2019–2022) of the PHOF consists of 66 high-level outcome indicator categories comprised of 159 individual indicators (16). The indicators are grouped into three overarching groups (*healthy life expectancy, differences in life expectancy,* and *healthy life expectancy between communities*) to be achieved across the public health system, and groups further indicators into four domains: 1) improving wider determinants of health; 2) health improvement; 3) health protection; and 4) healthcare public health and premature mortality (related to maximizing the population benefits of healthcare by, among other things, prevention) (17).

Australia's *National Preventive Health Strategy 2021–2030* (18) places a strong emphasis on long-term goals, prevention systems, and priority areas, drawing on existing national plans, strategies, and frameworks to align preventive action. While several other frameworks for performance measurement address specific aspects of public health in Australia—such as the *National Obesity Strategy* (19), the *National Framework for Communicable Disease Control* (20), and the *National Aboriginal and Torres Strait Islander Health Plan* (21)—the *National Preventive Health Strategy 2021–2030* stands out as the framework most focused on the public health system. This framework also prioritizes health equity, and sets targets and actions aimed to reduce health inequities.

TABLE 2. Overview of frameworks used in England, Australia, and the US to measure performance of public health systems

Characteristics of frameworks	England	Australia	United States
Consideration of structures, processes, and outcomes	Mainly outcome oriented	Mainly outcome and structure oriented	Mainly structure and process oriented
Public reporting	Yes (interactive dashboard, with local public reports)	Yes (public reports nationally, some dashboards sub-nationally)	Yes (public reports sub-nationally, one dashboard with average data nationally)
Integration of the essential public health functions	No	No	Yes
Integration of equity	Yes	Yes	Only PHAB and MAPP (out of 5 frameworks) integrate equity
Jurisdictional level	Framework applicable to national, regional, and local levels	Every state develops and adapts their assessment approach based on a national framework	Local NPHPS and MAPP are specific to local health departments. The other frameworks can be applied at Tribal, local, and state levels
Consideration of geographic variations	Yes	Yes	No, with exception of the state NPHPS

Abbreviations: EnvPHPS (Environmental Public Health Performance Standards); MAPP (Mobilizing for Action through Planning and Partnerships); NPHPS (National Public Health Performance Standards); PHAB (Public Health Accreditation Board)

The US frameworks involve a mix of state and local assessments, accreditation standards, planning tools, and an environmental health evaluation. The National Public Health Performance Standards (NPHPS) provide a guiding framework to identify the components and activities of public health systems and assess their performance and capacities. The NPHPS operates at the state and local (county) levels to assess public health system performance, focusing on a combination of all the entities involved in public health activities of a determined community, including all public, private, and voluntary organizations (22–24). The Environmental Public Health Performance Standards (EnvPHPS) complements the NPHPS by assessing the activities of environmental public health programs and systems with the aim to promote continuous improvement of environmental public health (25). The framework developed by the Public Health Accreditation Board (PHAB) ("PHAB framework") aims to guide public health departments at state and local levels to strengthen their public health systems through voluntary accreditation (26). Lastly, the Community Partner Assessment (CPA), replaced the NPHPS's local level framework (27) as the NPHPS was challenging to conduct and required adapting the evaluation tool to be relevant to communities. The CPA aims to evaluate 1) individual systems, processes, and capacities, and 2) collective capacity to address health inequities (27).

In the following sections, we describe the commonalities and differences observed in the assessment frameworks across the three jurisdictions.

Framework elements: structure, process, and outcomes

Most publicly reported indicators of public health system performance relate to health and equity outcomes, which provide valuable insights and help set targets that guide investments and track progress. There is also some consideration of structure and process indicators across the three countries we examined. Process indicators are more proximal to the delivery of public health programs and services and can inform quality improvement efforts, while structural indicators allow the tracking of the building blocks of public health systems and how they may impact the activities/processes and, ultimately, the outcomes (see **Appendices B** and **C** for a sample list of indicators used in the different frameworks in the three countries).

The frameworks in Australia and England predominantly focus on health outcomes, including social determinants of health. They set specific targets and use indicators to measure the effectiveness of strategies and programs in improving population health and well-being. The outcome indicators used by these jurisdictions relate mostly to morbidity and mortality trends for their priority causes of disease and death, and as such include environmental and social determinants of health. Australia's *National Preventive Health Strategy 2021–2030* also integrates structural enablers that will allow progress on public health interventions, such as leadership, governance, and funding. The strategy includes activities to be conducted or processes, such as developing targeted strategies or plans. Except for target indicators related to increased investment in prevention, their recent framework did not outline specific measures for these structural enablers and process priorities but instead highlighted broad policy achievements to be met by 2030 (18). From the strategy, it is unclear which entities are responsible for coordinating the implementation of the framework.

The focus of public health system performance assessment in the US primarily centres on measures related to the structures or processes/activities implemented to improve public health systems. In general, the frameworks developed in the US use measures to evaluate the activities conducted within public health departments through scales or categorical evaluations (23,25) and incorporating qualitative information (28). For example, the PHAB introduces indicators that evaluate whether public health departments engage in the examination and enhancement of policies and laws. The framework uses a qualitative approach, rather than

relying on quantitative indicators, requesting documents that substantiate the evaluation of these activities (28). PHAB also reports the aggregate results of the standards and measures on an online dashboard (29).

The PHAB and the National Association of County and City Health Officials (NACCHO)'s NPHPS local frameworks include measures related to structural capacity. NACCHO assesses and reports on measures related to budget, workforce, and other relevant measures in their National Profile of Local Health Departments—a study conducted by NACCHO every three years as a census of local health departments (30,31). PHAB collects measures on workforce and other related variables through their Capacity and Cost Assessment tool, which assists public health departments in evaluating their current spending and identifying investment gaps to fully implement the Foundational Public Health Services (FPHS) and transform their public health system (32). Nevertheless, PHAB's Capacity and Cost Assessment Tool is optional in the public health systems certifications, and it is not used for comparisons between and within states.

Public reporting

England's PHOF (15) prioritizes data transparency and public access to health information. An interactive web tool called Fingertips (15)a large public health system data collection portal) makes the PHOF data publicly available to help local areas understand, report on, and benchmark their performance against others, including the England average, and near and statistical neighbours. The Fingertips data tool presents indicator changes over time, with a clear indication of whether the values are rising or falling, and whether that change is "positive" or "negative." In the Australian context, our review revealed public reporting of assessment results through regional state reports and dashboards in some states. Each state independently formulates its public health plans and evaluations, employing distinct methods, priorities, and indicators (33,34). Although there is no national interactive public reporting in Australia, a novel interactive web tool has recently been developed for the Victorian Public Health and Wellbeing Outcomes Framework (35) to track changes in health and well-being over time within the state of Victoria. Also, although not specific to public health, the Australian Institute of Health and Welfare (AIHW) collates data from various sources across states and makes it available mainly upon request. The AIHW datasets include data related to homelessness, perinatal health, disability, alcohol and other drugs, and mortality (36).

The NPHPS and EnvPHPS frameworks in the US generate reports at local levels following a standardized system (22,25). While this approach allows for comparability across local health departments, public reports at the state level do not seem to include these direct comparisons. Further, local experts expressed concern about the reliability of NPHPS measures, and noted that there has been a shift away from their use in local and state public health systems. Also, the PHAB framework has standardized measures that are applicable at the different assessment levels (i.e., state, local, and Tribal–Indigenous–health departments) (37). According to local experts, these measures allow consistent assessment and reporting *within* states (with some variation related to diverse characteristics of local public health departments), while comparability *across* states is more challenging due to greater variation. Application of these frameworks at the local and state levels is reported internally and only shared with the accredited public health departments. However, the accreditation data is available in a de-identified format (not linked to public health departments) upon request for research purposes.

Integration of public health functions, collaboration, and equity

The integration of public health functions is implicit in Australia and England, with some alignment with the WHO essential public health functions (38). For example, public health reports in England vary in their focus and content but generally address three broad categories: health improvement, health protection, and healthcare public health (39). In Australia, the elements of the *National Preventive Health Strategy 2021–2030* framework implicitly align with the WHO essential public health functions, including: leadership, governance, and funding; partnerships and community engagement; research and evaluation; and monitoring and surveillance (18).

The US is the only jurisdiction among the three reviewed that explicitly defined and incorporated core public health functions within their performance frameworks (i.e., local-level NPHPS, EnvPHPS, PHAB, and CPA). The US frameworks assess public health systems using an outline that is guided by the Centers for Disease Control and Prevention (CDC)'s 10 Essential Public Health Services (10 EPHS). The frameworks generally consist of 10 domains; each represents one public health function with their own related indicators (37,40).

Collaboration and partnerships are integral to effective public health systems and can therefore inform the selection and monitoring of performance measures. A collaborative approach to indicator selection was apparent in Australia and England. England's selection of PHOF indicators involves extensive consultation with a range of stakeholders, including public health professionals, healthcare providers, local authorities, academics, community organizations, and the public and is informed by a review of available evidence on population health. Indicators are selected based on clarity, rationale, relevance, attributable, interpretation, validity, construction, risks, availability, affordability and value for money, desirability, timeliness, comparable disaggregates, and whether they support alignment. The framework and its indicators are revised every three years (15). Similarly, Australia's *National Preventive Health Strategy 2021–2030* builds on several sources, including public and expert consultations and existing national plans, strategies, and frameworks to align action in prevention (18).

Moreover, all three countries emphasize the importance of addressing health equity in their public health system performance frameworks. Indicators can be used to develop an equity index or set specific equity targets (e.g., the lowest-income neighbourhoods should achieve the level of performance of the average for the region or province). Most of the frameworks recognize and aim to reduce health inequalities among different population groups, and consider factors such as socioeconomic status, race and ethnicity, gender, and geographical location within the analysis of indicators and in setting targets. For example, England's PHOF includes indicators that focus on health inequalities and disparities such as reducing the gap in life expectancy and healthy life expectancy between communities and that help identify variations in health outcomes based on factors such socioeconomic status, ethnicity, gender, and geographical location. Further, PHOF recognizes the importance of social determinants of health by including indicators related to income, education, employment, and social environment (16).

The efforts to measure progress toward reducing inequalities in England extends to health system indicators such as Core20PLUS5 (41), a national approach by NHS England aimed at addressing healthcare inequalities (41). Similarly, Australia's national public health systems performance framework includes equity indicators related to health disparities in Indigenous communities, e.g., with the target that Aboriginal and Torres Strait Islander people will have at least an additional three years of life lived in full health by 2030 (18). Australia's strategy explicitly mentions Aboriginal and Torres Strait Islanders and Australians in the two lowest quintiles for the Socio-Economic Indexes for Areas, and Australians in rural and remote areas as priority populations

regarding equity targets. In the US, the PHAB framework includes a recommendation to examine indicators to reflect factors that contribute to health challenges such as the Social Vulnerability Index (37). Nevertheless, we did not identify examples of how the PHAB accreditation framework has been applied at the Tribal, local, and state levels in the US, since these are not publicly available. Moreover, according to local expert feedback, in practice, equity has not been fully endorsed in the application of the PHAB framework and performance evaluations.

In addition to disaggregating data by different demographic and socioeconomic factors to identify health disparities, certain frameworks in Australia (18) and the US (37) consider measures to support the engagement of priority groups in public health programs and services. In Australia, the *National Preventive Health Strategy 2021–2030* sets policy achievements for 2030 that actively involve the participation of priority populations (e.g., people who are Aboriginal and Torres Strait Islander, culturally and linguistically diverse, LGBTQI+, living with mental illness, of low socioeconomic status, living with disability, and those living in rural, regional, and remote areas). One illustrative example is the policy goal to co-design culturally appropriate, community-based programs that cater to the health needs of priority populations (18). However, our review revealed that none of the reviewed state frameworks and reports in Australia provide specific indicators detailing how these policy goals are to be measured (34,42,43). For instance, the Australian Capital Territory (ACT) *Preventive Health Plan Annual Activity Report (2020–2025)* mentions related activities, such as proving culturally appropriate early childhood education through the Koori Preschool Program but does not link these activities to specific indicators (44). The ACT *Annual Report for National Closing the Gap Agreement* (not specific for public health) includes an indicator that measures the percentage of Aboriginal and Torres Strait Islander children engaged in high-quality, culturally appropriate early childhood education (45). These frameworks underscore the importance of combining quantitative indicators with qualitative assessments.

Similarly, in the US, the PHAB framework asks public health departments to provide evidence on how they work and respond to the needs of Tribal health departments. Thus, some of the measures consider the needs of Tribal health departments—e.g., assessing the advancement of efforts to develop Tribal and local health department workforces (37). PHAB does not prescribe indicators for evaluating equity or other related measures and instead recommends the submission of required documentation as evidence to meet this measure. Documentation may include records demonstrating that the health department has provided training or other support to bolster the workforce of Tribal and local health departments (26). Moreover, PHAB has a Tribal supplement to help bridge its standards and measures for Tribal Health Departments; these materials were developed in partnership with Tribes.

Jurisdictional level and consideration of geographical variation

All three countries recognize the importance of tailoring public health assessments and strategies to the local context. Local frameworks typically align with national strategies but may vary when addressing specific needs and priorities at the regional level. The frameworks in England and Australia allow flexibility in their application, understanding that public health systems vary across geographical and administrative contexts. These countries provide a general national level framework that can be adapted to suit the unique needs, priorities, and structures of individual states, regions, or localities. Public health authorities in both countries have the legal obligation to develop public health plans and reports (18,39). In Australia, state-developed frameworks appear comprehensive, propose indicators across structural, processes, and outcomes domains; however, in practice, their evaluation reports were less structured and did not include all the proposed measures. For example, the long-term targets included in the Victorian framework are established based on

state policies, targets from national commitments, and international agreements. Furthermore, the indicators included in this framework were defined based on several criteria, including whether they are compelling, achievable, relevant, and understandable. Nevertheless, their 2019 public health and well-being report focused only on a subset of health outcomes and process indicators (34). Another challenge in Australia is the varying timeframes during which state-level activities run, as some states may have developed public health plans either before or after the adoption of the *National Preventive Health Strategy 2021–2030*.

In the US, some performance measurement is tied to voluntary accreditation of public health departments. Furthermore, all the reviewed frameworks in the US have established guidelines to conduct the assessments with a set of capabilities that every community should have. Instead of a flexible format to report on, health departments use the performance standards to describe an optimal level of performance and capacity towards which all public health systems should strive (23). The Association of State and Territorial Health Officials (ASTHO) has the responsibility to oversee public health system assessment materials at the state level and NACCHO administers the local level (22). However, some local experts noted that the NPHPS are currently considered outdated and that their implementation was onerous and therefore not widely used. Overall, the three countries vary in the extent that they balance local adaptation with comparability and opportunities for national benchmarking.

Proposed Framework

As a foundation to support monitoring efforts and strengthen public health system performance, we developed a foundational framework for adaptation and use in Canada. For each public health function and three elements of Donabedian's model, we provide, in **Table 3**, illustrative examples of concepts and indicators based on the feedback provided by experts and stakeholders from Canadian PTs during consultations. We highlight with blue the themes of indicators suggested by two or more jurisdictions. The selected concepts and indicators include a sample of quantitative and qualitative indicators and measures used or suggested for use in Canada.

In expanding our proposed framework, it is essential to incorporate structural indicators to comprehensively assess the public health system's capacity and resources. Structural indicators can include the supply and distribution of public health workforce, development of plans to assess workforce capacity, data and analytics infrastructure for population health assessment and surveillance, intersectoral partnership, and evidence-based knowledge and communication (18,37).

Health inequities and disparities can be evaluated by stratifying indicators based on social determinants of health to compare subgroups based on factors such as socioeconomic status, ethnicity, gender, and geographical location (e.g., rurality). The framework also integrates social determinants of health by considering factors like housing, culture, and immigration. Based on procedures adopted in other jurisdictions, we recommend regular reviews of the framework and indicators, especially during the early stages of implementation, with periodic updates once a set of measures is agreed upon. We recommend the initial revisions to involve consultations with a wide range of stakeholders comprised of representatives from all PTs and Indigenous partners to ensure adaptability to evolving national and sub-national public health priorities and the integration of Indigenous data sovereignty and transformation principles. Consideration can be given to adopting an approach like New Zealand's emphasis on health equity (46,47) and incorporating regular health equity reviews into the framework to ensure that all populations are effectively served (48).

We identified 10 emerging priority areas for the development of a public health system performance framework in Canada based on the frequency these were mentioned in the feedback during consultations. While these areas were commonly noted in the feedback, they might not reflect the priorities of all PTs. The emerging priority areas include 1) vaccination, 2) communicable diseases, 3) non-communicable diseases, 4) life expectancy, 5) injuries due to falls, 6) healthy behaviours, 7) maternal and child health, 8) dental health, 9) mental health, and 10) social determinants of health. Experts also mentioned the need to develop structural indicators, for example indicators related to the status of public health workforce (e.g., vacancy rates), public health workforce employment, and public health education and training programs. Furthermore, Canadian stakeholders raised the following considerations for developing and implementing a Canadian-tailored public health performance framework.

Partnership with and considerations for Indigenous communities: Representatives from five PTs and Indigenous Services Canada underlined the importance of Indigenous partnership throughout the framework's development. They emphasized the necessity for engagement with Indigenous leaders and communities from the onset, taking a distinctions-based approach, in identifying and developing priority indicators, to ensure that the public health system reflects the diversity of priorities and needs across Canada's Indigenous peoples. Additionally, the importance of integrating Indigenous data governance and sovereignty (48), was underlined. These principles, developed from the United Nations Declaration on the Rights of Indigenous Peoples [UNDRIP, (1)] standards, affirm the rights of Indigenous Peoples to control their data's collection, access, analysis, interpretation, management, dissemination, and reuse. Indigenous data sovereignty relates to two key principles: (a) the sovereignty of Indigenous Peoples over their data, regardless of its location or custodian, and (b) the right to access data necessary for their nation-building efforts (49,50).

National coordination: The representatives from four PTs emphasized the need for coordination and collaboration at the national level to establish a unified cohesive Canadian framework, and to mitigate duplication of efforts. Some representatives emphasized obtaining the endorsement of the Pan-Canadian Public Health Network for future development and refinement of a performance measurement framework.

Feasibility: Representatives from four PTs identified several feasibility challenges, including the difficulty in identifying and measuring meaningful or actionable indicators, ensuring comparability across PTs, the challenges of measuring structure and process indicators, and navigating the complexities of implementation within a federal system. Experts also highlighted the inherent complexities associated with establishing causality between structures, processes, and outcomes. Representatives from two PTs noted that a framework need not imply a clear cause-and-effect pathway between indicators. Experts also supported the selection of a core set of indicators that leverage existing data collection systems and infrastructure. They also discussed the challenge of how to effectively reflect the collaborative and interconnected responsibilities of overlapping systems such as public health and primary care and the difficulty of attributing outcomes such as preventable hospitalizations and deaths solely to one sector. Leveraging existing data on primary healthcare for indicator development could help draw attention to these overlapping areas of responsibility. Preventive activities related to primary care include (reducing) antibiotic and opioid prescribing, screening for cancers, mental health and substance use, vaccination in children under five years, maternal and newborn health (e.g., birth weight and maternal substance use), and sexual and reproductive health (e.g., syphilis and other sexually transmittable infections). An example of the existing data on preventive activities include the

performance indicators used in Ontario as part of the Public Health Units' accountability agreements to meet the Ontario Public Health Standards[1].

Intersectoral collaboration and prioritizing health equity: The representative of one province recommended intersectoral collaboration to explore data beyond the health sector such as in justice, education, and public health intelligence, to report on the social determinants of health. Further, all experts underscored the importance of embedding health equity across all indicator reporting. The representative of one province emphasized building regular health equity reviews into the framework to ensure that all populations are effectively served. These reviews could analyze data aggregated by social determinants of health, evaluate accessibility/reach, cultural safety in service delivery, and how well services meet the needs of marginalized groups. They could also evaluate the impact of existing policies on promoting more equitable outcomes.

[1] The Ontario Public Health Standards (2021) are available online at https://files.ontario.ca/moh-ontario-public-health-standards-en-2021.pdf (51)

TABLE 3. Framework with sample indicators provided during consultations with the PHDSC, Canadian stakeholders, and from Public Health Ontario Snapshots

		Structure	Process	Outcome
Public health system building blocks/enabling functions	**Organization and governance (including workforce)**	**Truth and Reconciliation:** • Plan to implement the cultural safety and humility standard (BC) • Trauma-informed care training (BC) • % Public health workforce trained in cultural safety and humility (adapted from CIHI) • % Indigenous employees (CIHI) • Indigenous staff supports in place (CIHI) **Public health workforce**: • Vacancy rates (NU) • % Trained in public health programs (NU)		
	Health system financing			
Indicators by Core Public Health Function	**Public Health Intelligence**			
	Health protection		**Vaccination:** • % Children meeting the vaccination schedule (NB, NU) (at age 2 & 7 [BC]) • % Coverage of specific vaccines (AB, BC) • Coverage of COVID-19 and flu vaccination in adults 65+ (BC) **Screening for communicable diseases:** • Congenital syphilis screening, STI testing (BC) **Screening for non-communicable diseases:** • Cancer screening (BC)	**Communicable diseases:** • Outbreak indicators (SK, NU) • Syphilis cases, STIs, COVID-19 and flu hospitalizations, antimicrobial resistance (BC) **Environmental health:** • Hospitalization and deaths for heat, and due to PM 2.5 (air pollution) (BC) **Life expectancy:** • Life expectancy by population group (BC), including for First Nations and non-First Nations (AB)
	Disease and injury prevention		**Maternal and child health:** • Enhanced maternal child health screening coverage (BC) **Water, sanitation and hygiene:** Access to clean water, adequate waste management systems (NU)	**Injuries due to falls:** • Reduced hospitalizations for falls among frail populations through preventive care (BC) • Rate of injuries for falls (BC, ON*) **Healthy behaviour:** • Decrease regional gap smoking rates, substance use deaths by population groups and regions (BC) • Rate of illicit drug toxicity deaths, alcohol related hospitalizations (BC, ON*)

Health promotion	**Policies on healthy behaviors:** • New health promoting food, alcohol, gambling policies introduced, or actions taken (BC)	**Child health:** • % Participation to Healthy Toddler Assessments (NB) • % Babies exclusively breastfed in 6 months (NB, ON*) • Participation in parenting skills training (BC) **Reproductive health:** • % Long-term contraception uptake (BC) **Nutrition:** • % Action on food/beverage/advertising (BC) **Dental health:** • % Students with at least one dental visit (BC) • Self-reported prevalence of dentist visits* (ON) **Health literacy:** • % Scientific literacy indicators (e.g., misinformation, confidence in public health advice) (SK) **Social determinants:** • % Living in core housing need (BC)**, % in crowded homes (NU), cultural wellness (NU, BC), Indigenous language use, trauma-informed care (NU, BC) • % Immigrant population* (ON) **Mental health:** • % Who talked to someone about suicide (BC) • % Drug and alcohol treatment completion/ supports (BC)	**Non-communicable diseases outcomes:** • Cancer mortality rate, incidence, survival (NU, ON*) • Decrease acute costs of chronic disease and injuries (BC) • Mortality from stroke* (ON) **Maternal and child health:** • % Teen pregnancy (BC), healthy birth weight (BC, ON), infant mortality (BC), post partum depression (ON*, BC), maternal substance use (ON, BC), school readiness (BC) • % Children with speech-language pathology needs (NB, ON*) **Mental health:** • % With mood disorder**, % with anxiety disorder**, self-harm hospitalizations, youth eating disorders. (BC) • % Perceived mental health is very good or excellent* (ON) • % Satisfied or very satisfied with life in general* (ON)
Emergency preparedness and response	**Training in emergency response:** • % Public health workers with Incident Command training level 100 (SK)	**Environmental risk surveillance**: • High risk food premises inspected, drinking water inspections (BC) **Communicable disease surveillance:** • Communicable disease tracking and warnings to public (BC) • Antimicrobial resistance actions (BC)	

Abbreviations: BC (British Columbia); NB (New Brunswick); NU (Nunavut); ON (Ontario); SK (Saskatchewan)
Note: We highlight with blue the themes of indicators suggested by two or more jurisdictions.
Sources: *Public Health Ontario Snapshot (52), **Health inequalities Data Tool (53), CIHI (54).

Conclusions

This review provides insights to inform the development a national public health system performance framework in Canada, mapping examples of indicators relevant to its PTs, grounded in the core functions of public health and Donabedian's structure, process, and outcomes components.

The framework was designed considering the approaches of three international jurisdictions (England, Australia, and the US) and engagement with public health experts and stakeholders to refine and enhance our framework and identify feasible indicators. From our review, four key considerations of performance frameworks emerged:

1. **Integration of structure, process, and outcomes:** While England focuses on health outcomes, Australia and the US also incorporate measures related to structure and processes. Given the challenges with attributing health outcomes to public health system structures and processes, a balanced approach that continues to emphasize the importance of monitoring health outcomes and equity, while also drawing attention to the structures (e.g., public health workforce) and processes (e.g., the delivery of high-quality, equitable public health programs and services) would provide a balanced and comprehensive overview of public health system performance across Canada and over time.
2. **Public reporting:** England's PHOF offers publicly available data through the Fingertips web tool, facilitating reporting and benchmarking at local and national levels. In Australia and the US, public reporting varies across local and regional levels, posing challenges for direct comparisons between or within states, and local-level improvement efforts. Consistent with the PHOF in England, and the ongoing efforts by CIHI to monitor progress toward achieving shared health priorities with new federal government investments in Canada, public reporting of selected public health system indicators will help to draw attention to the importance of public health systems while also strengthening accountability to the public for ongoing improvements.
3. **Integration of public health functions, collaboration, and equity**: England and Australia implicitly integrate public health functions, while the US explicitly defines and incorporates them. We observed collaborative efforts in indicator selection in Australia and England. For instance, in England this process involves consultations with various stakeholders and the review of evidence on population health. Additionally, all three jurisdictions prioritize integrating health equity by analyzing disaggregated data and establishing equity targets. In Canada, therefore, it will be important to consider developing and reporting on public health system indicators that capture the full range of core public health functions and allow for comprehensive equity disaggregation.
4. **Tailoring strategies to local contexts**: All three jurisdictions allow flexibility in applying their frameworks to address regional needs and priorities, acknowledging the diversity of public health systems. In Canada's decentralized federation, a flexible approach will also be needed, while simultaneously maintaining some level of comparability across the country.

Finally, consultations with stakeholders highlighted emerging priority areas for measurement, and emphasized the importance of engagement with Indigenous partners from the onset of framework development, national collaboration, feasibility considerations, intersectoral collaboration, and prioritizing regular health equity reviews in developing and implementing a public health performance framework in Canada. This review also uncovered some emerging priority areas for performance measurement that may provide a useful starting point for identifying and selecting shared priority areas across jurisdictions for routine measurement and reporting.

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Appendix A. Most Frequently Reported Indicators for Health System Performance Assessment in European Commission Report

The following indicators are listed in the European Commission report as the most frequently reported metrics of **health promotion and prevention** for health system performance assessment (*denotes indicators OECD reports international comparisons) (8).

TABLE A1. Most frequently reported indicators listed in the European Commission report

Vaccination coverage	• Childhood vaccinations • Percentage of infants vaccinated against diphtheria (and other vaccine-preventable disease)* • Proportion of children presenting their vaccination card at school entry health examinations with vaccination against hepatitis B (and other vaccine-preventable disease) • Percentage of 2 years old having received all mandatory vaccines • Measles vaccination in adolescents (% 1st and 2nd dose) • Bacillus Calmette–Guérin (BCG) vaccination of newborns
Human papillomavirus (HPV)	• Increase in coverage of HPV vaccination among 13-year-old girls • Percentage of women vaccinated for HPV among the female population
Influenza	• Proportion of people aged 65+ reporting a vaccination against flu in the past 12 months (survey data) • Proportion of people aged 65+ who have been immunised against influenza in the past 12 months (administrative data)* • Increase in coverage of seasonal influenza vaccination among the population • Increase in vaccination coverage of seasonal influenza among 65+ year old
Other	• COVID-19 vaccination coverage • Incidence rate for vaccine-preventable diseases
NCD screening	• Cancer screening • Proportion of women (aged 45–69) who have received a bilateral mammography in the past 2 years (administrative data) • Proportion of women (aged 50–69) reporting a mammography in the past 2 years (survey data) • Percentages of those turning up for breast cancer screening among those invited over a 2-year cycle • Proportion of women (aged 25–59) who have been screened for cervical cancer in the past year (administrative data) • Cervical cancer screening: proportion of women aged 25–59 years in the last 3 years • Proportion of women aged 25–65 years with a cervical cancer screening in the last 3 or 5 years (administrative data) • Colon cancer screening - organized programme (% men and women aged 50–74) • Proportion of people (aged 50 and over) who have undergone colorectal cancer screening in the past 2 years (administrative data) • Prostate cancer screening of men aged 50–69 years and men over the age of 45 if their parents and brothers had prostate cancer in the last 2 years
CVD and diabetes	• Early detection of diabetes in pregnancy • Early detection of diabetes in the general population older than 50 years and overweight/ obese people under 50 years with additional risk factors • Proportion of people aged 15 years and over according to the last measurement of blood cholesterol, blood pressure, blood sugar • Cardiovascular diseases high risk group screening of men aged 40–54 years and women aged 50–64 years in the last year
Lifestyle and risk factors	• Alcohol • Alcohol consumption per capita*

	• Percentage of adults who consumed alcohol at least once a week in the last 12 months, and adults who consumed alcohol at least once a week in the last 30 days • Percentage of adults who consumed alcohol daily in the last 30 days • Percentage of school-aged children who consumed alcohol at least once in the last 12 months and at least once in the last 30 days
High body mass index (BMI)	• Proportion of obese residents (aged 19–75)*
Physical activity	• Percentage of adults who report are physical active at least 30 min 5 and more days a week, and proportion of residents (aged 19-75) who are insufficiently physically active • Percentage of school-aged children who report at least 60 min of physical activity 5 or more times per week (counting with school hours) • Percentage of school-aged children who report at least 60 min of physical activity daily (counting without school hours) • Percentage of school-aged children who spend about 4 and more hours on screens per day (TV, computer, tablet, smart phone)
Smoking	• Percentage of adults who smoked electronic cigarettes daily in the last 30 days or daily in the last 12 months, and percentage of adults who used tobacco daily in the last 12 months or daily in the last 30 days* • Percentage of school-aged children who smoked at least once in the last 12 months, and at least once in the last 30 days* • Percentage of school-aged children who smoked electronic cigarettes or used other electronic devices for smoking at least once in the last 30 days* • Percentage of school-aged children who smoked electronic cigarettes or used other electronic devices for smoking at least once in the last 12 months • Tobacco consumption per capita • Percentage of successful tobacco quitters

Appendix B. Stakeholder Consultations

This appendix provides the questions included for stakeholder consultations with members of the PHDSC. **Table B1** shows the developing framework with sample concepts and indicators from England, Australia and the US.

We invite you to contribute to the refinement of our framework by addressing the following questions. Any other general comments and feedback is also greatly appreciated.

Applicability and relevance

1. Is the proposed framework applicable and relevant to the ongoing public health systems strengthening in your province/territory? Consider the specific initiatives, priorities, and challenges faced in your jurisdiction.

2. What suggestions do you have to improve the framework's applicability in your province/territory? Please note any sample indicators in the framework that are most relevant/ those least relevant.

Feasibility and current practices

3. What approaches are currently taken, or are being considered/developed, to measure aspects of public health system performance in your jurisdiction? Please provide examples and references of reports, frameworks, and indicators, if possible. Consider approaches at local/regional, and provincial/territorial levels.

4. What are the objectives of these current or planned performance measurement approaches (e.g., quality improvement, public reporting, accountability)?

5. With regard to indicators currently in use:
    a. Are any comparable across local public health units or regions within your jurisdiction?
    b. To what extent do they span structure, process, and outcome, and align with core public health functions?
    c. How is equity considered and measured?
    d. To what extent are they publicly reported?

Please provide examples where possible.

TABLE B1. Framework with sample concepts and indicators from England, Australia, and the US

		Structure	Process	Outcome
Public health system building blocks/ enabling functions	**Organization and governance (including workforce)**	• Establishment of innovative partnerships with priority population communities and organizations (e.g., document examples of health authorities engaging in ongoing strategic relationships) (AU, US) • Legal frameworks (e.g., existence of public health laws and policies) (AU, US) • Enhancement of the public health workforce availability and distribution (AU) • Culturally and linguistically appropriate programs and services (US)	• Increased evaluation of local initiatives, policies, and regulations (US) • Revision of existing PH laws once every 3-5 years, evaluate the effect of policies and regulations (US) • Increased investment in workforce roles and capacities, and skills (AU)	• Public opinion: e.g., the government of Canberra conducted a survey (scale-type answers) to measure the level of community support for the state plan's five broad priority public health areas, and their priorities for long-term health issues (AU)
	Health System Financing	• Annual public health expenditures, revenue scores, budgets over time (AU, EN, US) • Increase in investments in preventive health as a % of total health expenditure across Commonwealth, state, and territory governments (AU)		
Indicators by Core Public Health Function	**Public Health Intelligence**	• List surveillance systems used (e.g., Vaccine Adverse Events Reporting System), and the types of data being monitored (e.g., reportable or notifiable diseases, injury, occupational health) (US) • Ensure access to resources for early detection, investigations, containment, and mitigation of health hazards (e.g., identify policies or procedures on how health authorities maintain 24/7 access to resources for detection, containment, or mitigation for public health problems and environmental hazards) (US)	• Conduct and update community health assessments (US)	
	Health Protection	• Reduce environmental health risk factors (e.g., decrease emissions to net zero in 2050; (EN) • The number of public water systems by calendar year that had any environmental violations (US) • Monitoring and distribution close to real-time, nationally consistent air quality information, including consistent categorisation and public health advice (AU) • Increase green spaces to reduce urban heat and support the use of public spaces (AU, EN)	• % MMR vaccination coverage for one dose (2 years old) (EN) • Monitoring of lead in water in schools, and monitoring and adjustment of water fluoridation (US)	• % Reduction in the incidence of communicable diseases, containment of outbreaks (AU, EN) • % Morbidity and mortality due to environmental causes (e.g., fraction of mortality attributable to particulate air pollution (EN), physical injuries and deaths due to heat illness (US)) • Lower intakes of energy-dense, nutrient poor (discretionary) foods and drinks (AU, EN, US) • Lead exposure in children (EN)

	Disease & Injury Prevention	• Elimination of remaining tobacco-related advertising, promotion, and sponsorship (AU)	• Adoption of healthy behaviors, screening programs (e.g., more adults and children using active modes of transport; more people participating in active recreation and meeting the national physical activity guidelines across all stages of life) (AU, EN) • Reduction in smoking rates (AU, EN, US)	• Reduction in the incidence of preventable diseases and injuries (reduction in the incidence of target diseases, including % of adults living with overweight or obesity) (AU, EN, US) • Reduction in suicide rate (AU, EN, US) • Number of ED visits due to asthma (US, EN), and by top ranking causes (US)
	Health Promotion	• Safer walking and cycling infrastructure (AU, EN). For example, in Australia federal government plans for a better connected and maintained network, making active travel and bicycle parking easy to support behaviour change	• Participation rates in health promotion activities. For example, Australia measures the % of participation in organised sport outside school hours, adults participating in physical activity including sport at least once per week (AU) • Improved health literacy through education campaigns for parents (AU)	• Health-adjusted life expectancy (HALE); and life-expectancy (AU, EN). E.g., Australia measures HALE in men and women, by income group, geographic area, and ethnicity; England considers increased healthy life expectancy, and reduced differences in healthy life expectancy between communities as overarching indicators. • Total Disability Adjusted Life Years (AU). E.g., Australia targets include the proportion of the first 25 years lived in full health will increase by at least 2% by 2030
	Emergency preparedness and response	• Existence of emergency response plans and coordination mechanisms (AU, US) • Existence and implementation of evidence-based approaches to identify, address and mitigate the impacts of climate change on the health system (AU)	• Ensure conducting After Action Reports (AAR) (e.g., identify AAR that indicate an overview of events or drills, strengths, and improvements) (US) • Training exercises (e.g., identify plans outlining the purpose of scheduled drills and how these will be tested) (US)	• Environmental incidents (fire, airborne, person, drinking water, indoor air (EN) • Excess mortality during heat periods (EN)

Abbreviations: AU (Australia); **EN (**England); **PH** (public health)**; US** (United States).
Notes: The description of public health functions are from Canada's CPHO 2021 report, p. 49 (3)

Appendix C. Case Summaries of Frameworks Used to Evaluate Public Health Systems

England

In **Table C1**, we provide an overview of the frameworks used in England to assess the performance of the public health system. We indicate whether the frameworks consider the structural capacity necessary for public health interventions or processes, the interventions implemented, and the resulting outcomes (55). Moreover, we note whether they explicitly mention the application of essential public health functions (38); and whether they specify the jurisdictional level at which the frameworks operate. While the Public Health Outcomes Framework focuses on **outcomes** related to health and well-being (rather than measuring inputs or processes), the management of all levels within the public health system is guided by targets that prioritize structure and processes (56), as reflected in the public health reports. Note that Public Health Scotland, Public Health Wales, and the Northern Ireland office have their own collections.

Table C1. Overview of frameworks used in England to assess the public health system

	Public Health Outcomes Framework (PHOF)	Public Health Reports
Purpose	High-level overview of public health outcomes, at national, regional, and local level	Trace the progress of public health in national, regional, and local government year-on year
Consideration of structures, processes, and outcomes	Yes – Outcome oriented	Yes
Are the essential public health functions integrated?	No	No
Is equity integrated?	Yes	Yes
Jurisdictional level	National, Regional, and Local	National, Regional, and Local
Are geographic variations considered?	Yes	Yes

Public Health Outcomes Framework

Developed by the Office of Health Improvement and Disparities, Department of Health and Social Care, the *Public Health Outcomes Framework* (PHOF) sets out a high-level overview of public health outcomes, at national and local levels, supported by a broad set of indicators designed to show how well public health is being protected and improved (14). An interactive web tool by Fingertips (15), a large public health data collection, makes the PHOF data available publicly to help local areas understand, report on, and benchmark their position against others including the England average, and near and statistical neighbours.

The selection of indicators involves extensive consultation with a range of stakeholders, including public health professionals, healthcare providers, local authorities, academics, community organizations and the public and is informed by a review of available evidence on population health. Indicators are selected based on the following criteria (15): clarity, rationale, relevance, attributable, interpretation, validity, construction, risks, availability, affordability and value for money, desirability, timeliness, comparable disaggregates, supports alignment. The aim is to choose indicators that are evidence-based and have a strong association with population health outcomes. The framework and its indicators are revised every three years (15).

Framework components: Structure, process, outcomes

PHOF focuses on **outcomes** related to health and well-being, rather than measuring inputs or processes.

The current version of the PHOF consists of 66 high-level outcome indicator categories, which include 159 individual indicators (16). The indicators are grouped into overarching indicators (*healthy life expectancy, differences in life expectancy* and *healthy life expectancy between communities*) to be achieved across the public health system, and groups further indicators into four "domains" (57):

1. Improving wider determinants of health (e.g., *children in low-income families*; *first time entrants to the youth justice system*)
2. Health improvement (e.g., *low birth wight of term babies*; *percentage of physically active adults*)
3. Health protection (e.g., *population vaccination coverage PVC booster*; *TB incidence*)
4. Healthcare public health and premature mortality (e.g., *under 75 mortality rate from cardiovascular diseases considered preventable*; *estimated dementia diagnosis rate*)

The Fingertips Data Tool (15) presents indicator changes over time, with a clear indication of whether the values are rising or falling, and whether that change is "good" or "bad." In **Table C2**, we provide examples of the measures included in the PHOF, indicating whether these could inform the structure, process, or outcome.

Integration of public health functions

While PHOF provides a framework for evaluating outcomes, it doesn't explicitly group indicators by public health core functions. Nonetheless, PHOF was a key element of the public health reforms in 2013. The White Paper behind PHOF (41) sets out a vision for public health (to improve and protect the nation's health and well-being and improve the health of the poorest fastest), desired outcomes and the indicators that will help identify how well public health is being improved and protected. PHOF emphasizes the importance of using reliable and consistent data sources to measure progress (56).

Integration of equity

The framework emphasizes equity through its vision "To improve and protect the nation's health and wellbeing and improve the health of the poorest fastest" and collaboration among various stakeholders, including local authorities, healthcare providers, community organizations, and the public. By involving a range of perspectives and expertise, the framework aims to develop strategies that are responsive to the unique needs of diverse populations.

Furthermore, PHOF includes indicators that focus on health inequalities and disparities (e.g., A02: r*educed differences in life expectancy and healthy life expectancy between communities*) and that help identify variations in health outcomes based on factors such socioeconomic status, ethnicity, gender, and geographical location. Also, PHOF recognizes the importance of social determinants of health by considering factors such as income, education, employment, and social environment. The framework emphasizes the importance of collecting and analyzing data by different demographic and socioeconomic factors. Disaggregating data allows for a more nuanced understanding of health disparities and helps identify specific groups or areas requiring targeted interventions.

Jurisdictional level and consideration of geographical variation

In general, indicators in PHOF are presented at Upper Tier Local Authority, regional, and national levels. Where possible, data for Lower Tier Local Authorities, Combined Authorities, PHE Centres, Office for National Statistics area classification groups and subgroups, and local authority-based deprivation deciles are also presented (15).

Fingertips benchmarking reports (15) are used to compare performance at the local and regional levels and serve as a tool for local transparency and accountability. The Fingertips Data Tool (15) presents: a) indicator values for different areas alongside each other, b) indicators alongside comparator values, such as national or regional averages, targets or benchmarks, and c) highlights differences between local values and the selected reference value using red-amber-green (RAG) ratings. Reports on the Fingertips site supports the monitoring of specific public health issues. However, these reports are not used to hold local authorities accountable for meeting public health targets (56).

Public Health Reports

Public health reports provide up-to-date annual data and descriptions of the population's health status and its determinants and key actions areas (58). In addition to printed formats, online formats like websites, dashboards, or social media are also becoming increasingly important (59).

The delivery model for public health services in England is currently undergoing a major reorganization following the replacement of Public Health England by the UK Health Security Agency (focus on infectious disease control) and the Office of Health Improvements and Disparities (focus on improving nation's health and reducing health disparities), and the implementation of the *Health and Care Act* in 2022.

Framework components: Structure, process, outcome

The format and content of public health reports vary across jurisdictional levels and local authorities, though there are common elements that are often included in these reports. National (60) and local (e.g. (61) reports typically include indicators related to structure (such as recruiting staff or opening facilities), process (like maintaining immunization levels), and outcomes (such as a reduction in childhood obesity). When organizations produce public health reports, they often use the PHOF indicators as a foundation for assessing population health and specifically refer to the PHOF indicators relevant to their focus areas. However, public health reports may cover a range of topics beyond what is captured in the PHOF, addressing specific local priorities or emerging health issues (e.g., safer gambling, COVID-19). In **Table C2**, we provide examples of the measures used in different local-level applications of frameworks to assess the PH system, categorizing them by structure, process, or outcome.

Integration of public health functions

Public health reports in England vary in their focus and content but they often address the 3 domains of public health in England—health improvement, health protection and healthcare public health (39).

Integration of equity

Reports often specifically address health inequalities and disparities between different geographic areas and communities. This could include variations in life expectancy, rates of chronic diseases, and access to healthcare services. In 2017, Public Health England published a health equity report providing analysis and commentary on disparities across 18 PHOF indicators (62), with a particular focus on inequalities between ethnic groups. Core20PLUS5 (41) is a national approach by NHS England aimed at addressing healthcare inequalities at both the national and system levels. This strategy delineates a target population, referred to as "Core20PLUS," and pinpoints five specific clinical areas requiring expedited improvement. The approach has since been adapted to also encompass children and young people as well (41).

Jurisdictional level and consideration of geographical variation

Public health reports are typically produced at different jurisdictional levels, reflecting the administrative and geographic structure of the country. At the local level, authorities are expected to produce joint strategic needs assessments (JSNA) and joint local health and wellbeing strategies (JHWS) (63), agreed and adopted through the Health and Wellbeing Board (64), the planning and coordinating body for public health. They serve as a means of communication between public health agencies (UK Health Security Agency and Office for Health Improvement and Disparities), local authorities, and the community, providing a comprehensive overview of the state of public health and the strategies in place to improve and protect the well-being of the local population (56). The Director of Public Health (DPH, a statutory chief officer and member of the Health and Wellbeing Board, responsible for delivery of public health at upper tier and unitary local authority level) has a legal duty to create an annual public health report (56,65). These reports focus on the health of the population within a specific local jurisdiction, which could be a city, county, or district. They often address local health needs, initiatives, and the impact of public health programs within the area (e.g. through changes in outcome indicator trends). Local public health reports often consider geographical variation as a crucial aspect of their analysis. In some cases, local public health reports incorporate JSNAs. At the national level, public health reports cover the entire country and are often produced by national health agencies and government departments. For example, Public Health England (PHE) has historically played a key role in producing national-level public health reports. The reports provide an overview of health trends, emerging issues, and public health interventions on a national scale. As of 2023, the Department of Health and Social Care (66) and the UK Health Security Agency (67) publish annual reports describing performance against objectives and use of public funds. Annual reports are also published by the Chief Medical Officer (68) to track the advancements in public health on both a national and local levels.

Also, the Public Health and Prevention Team at the Local Government Association (national membership body of local governments, working with councils to support, promote and improve local government) produces regular public health reports (69–71) .

Table C2. Examples of indicators used in England frameworks at local and national level applications

Framework	Structure	Process	Outcome
PHOF Fingertips Reports Liverpool (70) England (16)	N/A	**Health protection**: % MMR vaccination coverage for one dose (2 years old) Population vaccination coverage Flu (2 to 3 years old)	• **Overarching indicators:** healthy life expectancy at birth; inequality in life expectancy • **Improving wider determinants of health:** children in absolute low-income families; loneliness: percentage of adults who feel lonely often or always or some of the time • **Health improvement**: smoking status at time of delivery, admission episodes for alcohol related conditions • **Health protection**: fraction of mortality attributable to particulate air pollution • **Healthcare public health and preventing premature mortality**: infant mortality rate, suicide rate
Annual Public Health Report, Liverpool (72)	Formation of Liverpool Childhood Immunisation Group; Public Health Spending Allocations	Community engagement with Community Champions across Liverpool; Liverpool Childhood Immunisations Sub-Group created; Flu pilot delivered across the country % MMR vaccination coverage for one dose (2 years old)	
Annual Public Health Report, Merton (73)	**Establishment of a new Government agency**: Active Travel England Training provision for "Green jobs" (employment that directly contributes to the achievement of the UK's net zero emissions target and other environmental goals, such as nature restoration and mitigation against climate risks)	**Merton Climate Strategy and Action Plan**: support new cycle paths and wider pavements (Active Travel Plan); consult on emission-based parking charges; help build low carbon skills; encourage waste reduction; encourage green businesses; maintain existing green spaces and plant more trees; lobby for tighter regulations and further funding for low carbon building; Active Travel Plan and Cycling and Walking Investment Strategy; Merton Air Quality Action Plan 2018 – 2023 net-zero organization by 2030, decrease emissions across the borough to net zero in 2050, reduce waste collected by local authority by 75%; improve energy use of buildings through insulation, renewable energy, and low carbon heating; increase number of active travel journeys while decreasing number of petrol and diesel cars and increasing number of electric charge points; increase green canopy cover	**Reduce**: inequality in life expectancy; fraction of mortality attributable to particulate air pollution; emergency hospital admission for asthma; years of life lost to premature mortality by over 2%
Department of Health and Social Care Annual Report 2021–2022 (74)	Funding for infection prevention control measures, rapid testing, local authorities; Vaccine Taskforce; Antivirals Taskforce	Living with Covid Strategy; Covid 19 infection survey; Spring Booster programme; Test & Trace Service; rapid response research call; Covid-19 vaccination uptake	% of people who tested positive for Covid-19, number of people in hospital with Covid-19; death within 28 days of positive Covid-19 test
Chief Medical Officer's Annual Report 2023, Health in an Ageing Society (68)	N/A	Recommendations for individual and government (national and local) actions to enabling older adults to live free from disease for longer; supporting older adults to live well with disease; physical environments that enable independence; research priorities to improve health and ageing society), innovation	% of population aged 75 and over, morbidity rate by top 10 causes; inequality in life expectancy; proportion of life lived in poorer health; physical activity per week; % of adults living with overweight or obesity; smoking rates
Environmental Public Health Surveillance System (75)			Environmental incidents (e.g., fire, airborne, person, drinking water, indoor air); Incidents reported by agent type (e.g., carbon-monoxide mercury, lead); Lead exposure in children; Excess mortality during heat periods

Australia

There are different health plans and frameworks in Australia that incorporate prevention goals and indicators (76,77); nevertheless, we focused on frameworks that specifically aimed to assess aspects of the public health system. At the federal level, Australia developed the *National Preventive Health Strategy 2021–2030,* establishing the ideal national goals and activities in public health, while states develop and implement their own public health strategies and frameworks. In **Table C3**, we provide an overview of the frameworks used in Australia to assess the performance of the PH system. We indicate whether the frameworks consider the structural capacity necessary for public health interventions or processes, the interventions implemented, and the resulting outcomes (55). Moreover, we note whether the frameworks explicitly mention the application of essential public health functions, which represent a set of actions necessary to meet public health goals (38). We also specify the jurisdictional level at which the frameworks operate and whether they include considerations for its use in different locations. In column "Local Public Health Reports," we indicate the overall application of the national framework at the local level.

The national framework to assess the public health system in Australia does not explicitly integrate the essential public health functions, but some of its elements align with the WHO proposed functions (38). This framework examines structural resources as system enablers and processes as policy targets. Some of the applications and frameworks developed at the local level aim to measure structure and process indicators more explicitly.

Table C3. Overview of frameworks used in Australia to assess the public health system

	National Preventive Health Strategy 2021–2030	Local Public Health Reports
Purpose	Strengthen prevention system	Strengthen local prevention system and meet national goals
Consideration of structures, processes, and outcomes	Structure and outcome oriented	Outcomes oriented
Are public health functions integrated?	No	No
Is equity integrated?	Yes	Yes
Jurisdictional level	National	State, regional, local
Are geographic variations considered?	Yes	Yes

National Preventive Health Strategy 2021–2030

The National Preventive Health Strategy aims to create a sustainable and more effective prevention system to tackle the increasing burden of disease, reduce health inequities, and strengthen preparedness for health threats. This strategy considers improving prevention by involving the health system and entities in other sectors that might have an impact on the population's health. Several sources were used to develop this strategy, including public and expert consultations and existing national plans, strategies, and frameworks to align action in prevention (18). Examples of these strategies, with long-term targets for public health, include the *National Obesity Strategy* (19), *National Framework for communicable disease control* (20), and the *National Aboriginal and Torres Strait Islander Health Plan* (19).

Framework Structure: Structure, process and outcomes

The strategy emphasizes priority areas of focus and goals to achieve in a period of 10 years, following a strategic *Framework for Action*. This framework is organized into three interrelated elements. One considers the system enablers that will allow progress with the public health interventions such as leadership, governance, and funding (18). The second focuses on priority areas to achieve progress towards meeting long-term goals, many of which have national strategies and plans to guide action (33). The third element of the framework considers the continuous support and enhancement of the current preventing actions (18).

The *Framework for Action* does not explicitly mention a structure, process, and outcome outline. However, its elements are mainly oriented to improve and assess the structure through prevention system enablers. Except for "increased investment in prevention," the framework system enablers do not propose specific measures but rather "policy targets." Moreover, this framework focuses on outcomes by offering a set of targets to achieve for each area of focus, indicating baseline figures and goals to meet (18). The processes or prevention interventions are broadly mentioned in the framework, although these are linked to all existing national plans and strategies, including the *National Tobacco Strategy* and the *National Injury Prevention Strategy* (33). In **Table C4**, we provide examples of the measures included in the *Framework for Action*, indicating whether these could inform the structure, process, or outcome.

Integration of public health functions

This framework does not explicitly integrate the public health functions within its structure. However, some of its elements share similarities with the WHO essential functions (18). For example, some of the "Mobilising a prevention system" framework elements align with the WHO essential public health functions, including: 1) leadership, governance, and funding, 2) partnerships and community engagement, 3) research and evaluation, and 4) monitoring and surveillance (18).

Integration of equity

The *National Preventive Health Strategy* recognized priority populations as those experiencing a disproportionate burden of disease. This strategy dedicates a section to describe the relevance of integrating equity strategies to improve the health of communities and lists some of the country's priority populations: Aboriginal and Torres Strait Islander people, culturally and linguistically diverse, LGBTQI+, people with mental illness, people of low socioeconomic status, people with disability, and those living rural, regional, and remote (18).

This framework includes the objective of reducing health inequities and emphasizes adopting a health equity approach in all preventive health activities so that the needs of community groups with poor health outcomes are considered (18). The strategy acknowledges that some sub-populations are more affected by various determinants of health and includes equity targets: 1) Australians in the two lowest socio-economic quintiles for area will have at least an additional three years of life lived in full health by 2030, 2) Australians in regional and remote areas will have at least an additional three years of life lived in full health by 2030, and 3) Aboriginal and Torres Strait Islander people will have at least an additional three years of life lived in full health by 2030 (18).

Moreover, this framework incorporates policy achievements by 2030 that involve the participation of priority populations. For example, within the goal to improve access to and consumption of a healthy diet, the strategy proposes the policy achievement to co-design community-based programs that are culturally appropriate and meet the health needs of priority populations. The strategy considers the design of programs to increase the

accessibility of priority populations, including the availability of tailored, culturally appropriate, and accessible communication (18).

Jurisdictional level and consideration of geographical variation

This strategy aims to improve the prevention system nationally; however, it acknowledges that to achieve this, all levels of government and the non-government sector are required. While we did not identify considerations to adapt this strategy to different jurisdictional levels, the strategy is flexible with its implementation across all levels of government (18).

Local public health reports

Framework structure

States have developed local frameworks to assess their preventive health system. However, it is not required that states develop their strategies after the *National Preventive Strategy 2021–2030* was created, or that these are aligned in design, goals, or time horizon. Local frameworks either develop dedicated public health strategies or integrate public health elements into various other strategies. Moreover, state-level strategies tailor their plans and assessments by incorporating their own evaluation structures and prioritizing health areas based on their specific needs. Overall, the national and state-level strategies tend to converge as priorities are shared, ideas are spread, and targets are co-adopted.

Some of the reviewed local frameworks utilize a structure, process, and outcome outline in their frameworks to evaluate their preventive systems; however, in practice their progress reports are mainly outcome oriented. For example, the Victorian public health and wellbeing outcomes framework (published before the *National Preventive Strategy 2021–2030*) explicitly considers the inputs and resources invested, the process plans, and the outcomes measured through pre-established indicators and targets grouped into five domains: health status, culture and community, environmental sustainability, public engagement, and safety (42,78,79). The long-term targets included in the Victorian framework are established based on state policies, targets from national commitments, and international agreements. Furthermore, the indicators included in this framework were defined based on several criteria, including whether these are compelling, achievable, relevant, and understandable. Nevertheless, their 2019 PH and wellbeing progress report focuses only on a few health outcomes (34). In **Table C4**, we provide examples of the measures used in different local-level applications of frameworks to assess the PH system, categorizing them by structure, process, or outcome. A novel interactive web tool has recently been developed for the *Victorian Public Health and Wellbeing Outcomes Framework* (35) to track changes in health and well-being over time within the state of Victoria.

Integration of public health functions

None of the local frameworks reviewed explicitly incorporate the essential functions of public health. However, certain elements within these frameworks may align with the functions outlined by the WHO. For example, the Australian Capital Territory (ACT) *Preventive Health Plan 2020–2025* includes such elements as research and infrastructure planning (33).

Integration of equity

The reviewed subnational frameworks acknowledge inequities in health determinants as contributors to disparities in health outcomes and include equity as a main component of their frameworks (42,43). For example, despite being defined as equality rather than equity, one of the objectives of the Victorian public health and well-being outcomes framework is to reduce public health and well-being inequalities. As such, this framework aims to monitor and report differences between population groups, including Aboriginal and Torres

Strait Islander people and culturally and linguistically diverse groups. Furthermore, for each of the measures proposed, the framework specifies the availability of data to conduct the measures in different populations (by age, sex, aboriginal, cultural diversity, sexual orientation, socioeconomic status, disability, mental health, and chronic diseases) at various levels (state, metropolitan/rural, regional, and local) (42). Each state defines its priority populations, for example, the *ACT Preventive Health Action Plan 2023–2025* also includes people experiencing homelessness (43). We did not find any mention in the Victorian or ACT frameworks about the engagement and participation of Aboriginal people and other priority groups in the public health system assessments.

In practice, the Victorian public health and well-being progress report, although limited, included a few outcome comparisons between communities (prevalence of smoking among Indigenous and non-Indigenous adults) and sex (male vs. female suicide rates) (34). The interactive web tool for the *Victorian Public Health and Wellbeing Outcomes Framework* visually illustrates changes in inequalities over time and by different demographic breakdowns of inequality (e.g., socioeconomic status, Aboriginal, mental health) (35), jurisdictional level, and consideration of geographical variation.

In Australia, states are legally required to develop their own public health plans and evaluations, which are based on national and state health plans. Some examples of using the national strategy at the local level in Australia suggest its potential applicability to different levels adaptable to the prevention responsibilities at each level (79). For example, the *Victorian Public Health and Wellbeing Outcomes Framework* web tool presents data by different geographical regions (35). However, not all the local public health reports describe the levels of applicability of their guidelines, such as the *Framework for the Australian Capital Territory's Public Health System* (80).

Table C4. Examples of indicators used in the frameworks used in Australia and in some of the state and local applications

Framework	Structure	Process	Outcome
National Preventive Health Strategy* (18)	**Leadership, governance and funding**: health lens applied to all policy through cross-sectoral partnerships **Prevention in the health system:** preventive health capabilities of primary health care professionals **Partnerships and community engagement**: establishment of innovative and strategic partnerships within sectors that influence health, to ensure shared decision-making and to drive evidence-based change **Investment in prevention is increased:** investment in preventive health will rise to be 5% of total health expenditure across Commonwealth, state and territory governments by 2030 **Workforce**: Increased investment in workforce roles and capacities. Enhancement of the availability, distribution, capacity and skills of the workforce **Equity**: Preventive health partnerships with priority population communities and organisations are established and strengthened; Collection of demographic information in national data sets is improved, especially for priority populations, to ensure differences in health and wellbeing outcomes can be measured Elimination of remaining tobacco-related advertising, promotion and sponsorship **Emergency preparedness and response**: A national strategic plan addressing the impacts of environmental health, including horizon scanning to identify and understand future threats, is developed and implemented in alignment with this Strategy and the work of the Environmental Health Standing Committee (enHealth) • A national framework is developed to address the impacts of emergencies and disasters on mental health and wellbeing • Monitoring and distribution close to real-time, nationally consistent air quality information, including consistent categorisation and public health advice	**Research and evaluation**: Increased evaluation of local initiatives, Health economics is included in research and evaluation Enhance referral pathways to community services **Improving immunisation coverage:** HPV immunisation rate increased to at least 85% for both boys and girls by 2030 **Equity**: Health and health care information is developed with priority populations, and is tailored, culturally appropriate and accessible (includes Aboriginal and Torres Strait Islander communities, people with disability and CALD communities – culturally and linguistically diverse); availability of tailored, culturally appropriate and accessible communication; strategic targeting vaccination to priority populations • Achieve a national daily smoking prevalence of less than 10% by 2025 and 5% or less for adults (≥18 years) by 2030 **Increasing physical activity:** Reduce the prevalence of physical inactivity amongst children, adolescents and adults by at least 15% by 2030 **Reducing alcohol and other drug harm:** Less than 10% of pregnant women aged 14 to 49 are consuming alcohol whilst pregnant by 2030	**Equity**: Australians in the two lowest socio-economic indexes for areas quintiles will have at least an additional three years of life lived in full health by 2030, Australians in regional and remote areas will have at least an additional three years of life lived in full health by 2030, and Aboriginal and Torres Strait Islander people will have at least an additional three years of life lived in full health by 2030 • Zero suicides for all Australians • Reduction in the incidence of preventable diseases and injuries (reduction in the incidence of target diseases such as "At least a 10% reduction in harmful alcohol consumption by Australians (≥14 years) by 2025 and at least a 15% reduction by 2030"

Framework at state level	Structure	Process	Outcome
ACT Public Health Framework* (43,44)	**Enabling active living:** Promote active travel through safer walking and cycling infrastructure, a better connected and maintained network, making active travel and bicycle parking easy and working with communities to support behaviour change; Increase the quality and quantity of living infrastructure, including tree canopy cover and surface permeability, to reduce urban heat and support the use of public spaces, including along active travel routes; Limit the number of fast-food outlets around children's settings such as schools, early childhood centres and recreational parks	**INFANT program** to increase health literacy and support families to develop healthy habits in the first 1000 days; Increase access to pre-natal and early parenting support for parents at risk of engagement with child protection	**Supporting children and families**: More children are physically, socially and emotionally ready to start school **Enabling active living**: More adults and children using active modes of transport; More people participating in active recreation and meeting the national physical activity guidelines across all stages of life **Healthy eating**: Lower intakes of energy-dense, nutrient poor (discretionary) foods and drinks
Application at state level: **ACT Public Health Framework* (81)**	**Enabling active living:** The ACT Government has installed new bike repair stations across the city; co-design outdoor spaces at the school that addresses physical activity and mental health outcomes for students and the wider community	**Enable active living**: Percentage of participation in organised sport outside school hours, adults participating in physical activity including sport at least once per week **Healthy eating**: introduced policy that aims to limit exposure amongst the Canberra community to advertising of unhealthy food and drinks **Enabling active living: I**ncrease the quality and quantity of living infrastructure, including tree canopy cover and surface permeability	**Health outcomes:** Canberrans suffering from a long-term health condition, e.g., asthma, backpain, cancer **Public opinion**: The government of Canberra conducted a survey (scale-type answers) to measure the level of community 'buy-in' and recognition of the prevention work of the state. Sample questions included 1) How important are the following issues to you? (i.e., treating and preventing illness, cost of living, unemployment, climate change); 2) Agreement with state plan five broad priority areas; 3) Which long-term health issues concern you the most?; and 4) Who should take action in preventive activities? (i.e., individuals, NGOs, federal government, state government)

Framework at state level	Structure	Process	Outcome
Victorian Public Health and Wellbeing Outcomes Framework* (42)	N/A	**Health and wellbeing targets:** 95% coverage of school entry immunisation; Notification rate for vaccine preventable diseases; HPV three-dose vaccination coverage for adolescents turning 15 years of age **Capabilities to participate**: Increase educational attainment; Proportion of children at school entry who are developmentally on track	**Health and wellbeing targets**: 25% decrease in premature deaths due to chronic disease; Halt the rise in diabetes prevalence; Virtual elimination of HIV transmission by 2020; 30% decrease in smoking by adults; 25% of the state's electricity from Victorian-built renewable generation by 2020 and 40%t by 2025; Proportion of adolescents 10–17 years who consume sufficient fruit and vegetables **Equity**: Rate ratio of premature death between socioeconomic disadvantage quintiles; Rate ratio of premature death between Aboriginal and non-Aboriginal Victorians; Rate ratio of premature death between local government areas
Application at state level:			
Victorian Public Health and Wellbeing Progress Report* (34)	N/A	N/A	Premature deaths due to chronic disease, diabetes prevalence, smoking by adolescents, coverage of school entry immunisation, physical activity prevalence of adolescents

Abbreviations: **ACT** (Australian Capital Territory); **N/A** (Not applicable; since the framework does not explore that area).
***Note**: We categorized some of the indicators into structure, process, and outcomes as applicable. The indicator names and their categories are those used by the local reports.

United States

The US frameworks involve a mix of state and local assessments, accreditation standards, planning tools, and an environmental health evaluation. In **Table C5**, we provide an overview of the frameworks used in the US to assess the performance of the public health system. We indicate whether the frameworks consider the structural capacity necessary for public health interventions or processes, the interventions implemented, and the resulting outcomes (55). Moreover, we note whether the frameworks explicitly mention the application of essential public health functions, which represent an indispensable set of actions necessary to meet public health goals (38). We also specify the jurisdictional level at which the frameworks operate and whether they include considerations for its use in different locations. In column "Local Public Health Reports," we indicate the application of the national framework at the local level.

The frameworks used in the US explicitly integrate essential public functions within their assessments and are applicable across various jurisdictional levels. Although these frameworks do not explicitly delineate structure, process, and outcomes measures, they do include indicators within these categories.

Table C5. Overview of frameworks used in the US to assess the public health system

	NPHPS		EnvPHPS	PHAB	MAPP's CPA
	State	Public Health Reports			
Purpose	Assess state public health system performance and capacity	Focuses on local public health systems	Continuous improvement of environmental public health	Guide public health departments through public health system accreditation	Assess community partners' individual systems, processes, and capacities
Consideration of structures, processes, and outcomes	Structure and outcome oriented	Structure and process oriented	Process oriented	Structure and process oriented	Structure and outcome oriented
Are the essential public health functions integrated?	Yes	Yes	Yes	Yes	Yes
Is equity integrated?	No	No	No	Yes	Yes
Jurisdictional level	State and local	Local	National, state, Tribal, territorial, and local	State, local, Tribal	Local
Are geographic variations considered?	Yes	No	No	No	No

Abbreviations: **CPA** (Community Partner Assessment); **EnvPHPS** (Environmental Public Health Performance Standards); **MAPP** (Mobilizing for Action through Planning and Partnerships); **NPHPS** (National Public Health Performance Standards); **PHAB** (Public Health Accreditation Board)

Framework 1: National Public Health Performance Standards

The CDC's National Public Health Performance Standards (NPHPS) provide a guiding framework to identify the components and activities of the public health systems and assess their performance and capacities. The NPHPS operates at the state and local (county) levels, for which two host agencies develop and manage the assessment instruments and supporting resources. The Association of State and Territorial Health Officials (ASTHO) has the responsibility to oversee the assessment materials at the state level and the National Association of County and City Health Officials (NACCHO) administer the local level (22). The NPHPS at both jurisdictional levels assess the PH system performance focusing on the combination of all the entities involved

in public health activities of a determined community, including all public, private, and voluntary organizations, such as hospitals, schools, community centres, and transit (22–24). Moreover, these assessments include the involvement of the public health agency (i.e., health department) at each level. Health departments are defined as "the governing entity with primary statutory authority to promote and protect the public's health and prevent disease in humans" and their structure and functions can vary across counties and states (24). All these public health system partners complete the assessments, and, for the state level, the state health department tends to lead the evaluation; we did not find suggestions for leadership at the local level (23,24).

Framework structure: Structure, process, outcomes

Each of the hosting entities, ASTHO and NACCHO, offers distinct approaches for evaluating the public health systems across jurisdictional levels. None of these frameworks explicitly mentions a structure, process, and outcomes outline within their guidelines. ASTHO's framework assess the state public health system through four "modules," each comprising standards and measures used by the Public Health Accreditation Board. Although ASTHO provides a module-based outline for conducting state-level assessments, the agency does not suggest a pre-established assessment framework due to differences in centralization. Instead, it offers examples of frameworks used by different states for each of the modules (24). The list below outlines the four modules guiding ASTHO's framework:

1) Module 1: Identifying and Engaging System Stakeholders
2) Module 2: Collecting and Analyzing Health Status Data
3) Module 3: Collecting and Analyzing Stakeholder and Community Input Data
4) Module 4**:** Summarizing, Presenting, and Communicating Findings

ASTHO's module framework primarily emphasizes the reporting of **structural** and health **outcomes** data. This framework does not mention reporting on the process or public health interventions conducted in each state. This state-level guideline does not offer a preestablished set of measures or indicators to assess, instead, it provides guidance on selecting and prioritizing indicators so these represent the various determinants of health, suggests potential lists of indicators (i.e., state and federal indicator lists and plans, and evaluations) and criteria select amongst all the possible indicators (e.g., seriousness and quality of data). Similarly, ASTHO's frameworks does not provide assessment criteria for the data collected, such as gold standards; however, it suggests identifying trends and generate meaningful conclusions to recognize problems, and design and evaluate programs for their continuous improvement (24).

NACCHO's local-level framework assesses the activities or **processes** that local jurisdictions should conduct based on the CDC's essential public health functions. As listed below, this framework consists of 10 sections, each of them representing one public health function in the context of three core functions: 1) assessment, 2) policy development, and 3) assurance (**Figure C1**). Each section includes performance measures to evaluate the local public health systems based on a Likert scale of optimal performance (23).

Figure C1. Public health functions grouped into core functions

Although the ASTHO and NACCHO frameworks do not explicitly mention a structure, process, and outcomes framework, the CDC supported the development of a conceptual framework that identified the components of the public health system using Donabedian's model for quality evaluation (55). Within this new framework, the NACCHO's public health performance measures inform the **processes**, while the capacity measures (resources) included in the NACCHO's *National Profile of Local Health Departments* (a study conducted by NACCHO every three years as a census of local health departments (30,31)) form the **structure**. While the authors do not advise for a particular set of indicators to measure the PH system outcomes, the groups of indicators suggested in the ASTHO's state framework (31) could inform measures for the **outcomes.** In **Table C6**, we provide examples of the measures included in ASTHO and NACCHO's framework indicating whether these could inform the structure, process, or outcome.

Integration of public health functions

ASTHO's state-level framework does not mention the public health functions within its suggested structure. However, as described in the framework structure section, NACCHO's local-level framework explicitly incorporates these functions into its framework.

Integration of equity

Neither of the ASTHO's state-level framework and the NACCHO's local-level framework incorporate guidance or indicators on equity. Health equity is mentioned in the state-level framework as one of the recommended criteria to select assessment indicators and is defined as issues that disproportionately affect population subgroups (31). The local-level framework mentions health equity as one of the goals of local public health systems as part of improving community health. Although, the framework does not define health equity or provide further recommendations (23). These frameworks do not mention collaboration with specific population groups to ensure equity, such as Indigenous groups.

Jurisdictional level and consideration of geographical variation

ASTHO's state-level guideline is a tool for health departments voluntarily seeking accreditation through the Public Health Accreditation Board and for those not seeking accreditation. This framework is flexible in the outcomes it assesses, considering each state's unique priorities and plans (24). Although the specific data to be reported are not predefined and may vary based on individual state priorities, ASTHO recommends considering data related to demographic and socioeconomic information, health status, behavioral risk factors, and environmental conditions (24). For example, in 2020, the Alabama Department of Public Health identified "leading health indicators" based on the top ten (out of 59) important health issues rated by different stakeholders and reported their trends since 2015 (82). Alabama considered a range of economic, demographic, access, and health indicators; however, it did not organize the report within a structure, process, and outcome framework. In **Table C6**, we provide examples of the measures used in different state-level applications of the ASTHO's framework categorizing them by structure, process, or outcome.

Local public health reports

The NACCHO's local-level framework has pre-determined performance measures that all local public health systems should assess. This framework does not mention specific consideration for its use in diverse locations; however, it notes that the performance standards describe an optimal level of performance and capacity to which all local PH systems should strive for, serving as a benchmarking system. For example, San Francisco, California (2012) (83) and Henrico, Virginia (2017) (84) reported, with variations in the levels of detail, their local public health system assessments using all NACCHO's indicators and measurement system. None of these frameworks organized the report within a structure, process, and outcome framework. Local experts consulted in this rapid review suggested that both, the state- and local-level frameworks are outdated, and their application and measures are laborious and unreliable. In **Table C6**, we provide examples of the measures used in different local-level applications of the NACCHO's framework categorizing them by structure, process, or outcome.

Framework 2: Environmental Public Health Performance Standards

The Environmental Public Health Performance Standards (EnvPHPS) aim to promote continuous improvement of environmental public health. This framework was developed by a CDC expert panel that included ASTHO and NACCHO (85) and complements the NPHPS, assessing the activities of environmental public health programs and systems. This assessment can be used to evaluate specific programmatic areas, departments, or the environmental health system. The environmental health evaluation is conducted by a team composed of diverse members representing the individuals and agencies involved in the environmental health service under assessment (25).

Framework structure: Structure, process, outcomes

The EnvPHPS shares a similar structure with NACCHO's local-level framework, comprising 10 sections that correspond to environmental public health essential services (EPHS). The EnvPHPS defines optimal performance standards for these services, evaluated through a set of questions with categoric answers. Although this assessment framework does not explicitly mention the adoption of a structure, process, and outcome framework, it mainly focuses on the **processes** or interventions. Moreover, the EnvPHPS has the potential to adopt a similar approach as the NPHPS, which incorporates the NACCHO's public health capacity measures and the National Profile of Local Health Departments as structure measures (25).

Integration of public health functions

Similar to NACCHO's local-level framework, the EnvPHPS explicitly integrate public health functions tailored to environmental health within its assessment system (25).

Integration of equity

The EnvPHPS framework mentions environmental equity as one of the objectives of the environmental health systems or programs but does not provide definitions or further recommendations on how equity is applied within the framework. The EnvPHPS do not mention collaboration with specific population groups to ensure equity, such as Indigenous groups.

Jurisdictional level and consideration of geographical variation

The EnvPHPS mentions that this framework can be used at the at the state, Tribal, local, territorial, and national levels, and set the level of performance that all environmental public health programs should aspire. However, we did not find descriptions of considerations to apply this framework at these different levels (25). We found a 2014 assessment of the environmental public health service delivery system by the Florida

Department of Health in Broward County, where several stakeholders assessed the 10 essential EPHS using all the EnvPHPS questions and scores but did not mention a structure, process, and outcome outline (86). Also in 2014, the Department of Health in Broward County used the EnvPHPS for a vector assessment, which evaluated the EPHS focusing on vectors (87). In **Table C6**, we provide examples of the measures used in different applications of the EnvPHPS framework, categorizing them by structure, process, or outcome.

Framework 3: Public Health Accreditation Board's Public Health Frameworks

The Public Health Accreditation Board (PHAB) developed a series of "Standards and Measures" that form the basis of the US governmental public health department accreditation program. The PHAB measures were last updated in 2022 and guide public health departments at state, local, Tribal, and territorial levels, as well as at military installations, strengthening their public health systems through accreditation (26). This accreditation is voluntary in most states, and 41 (out of 50) **state** public health departments, 322 (out of almost 3,000 (88)) **local** public health departments, and 6 (out of 574 federally recognized Tribes) **Tribal** public health departments have gone through accreditation (26). PHAB has also accredited the Ministry of Public Health in Doha, Qatar, for five years, being its first ministry of health accredited outside the US (89).

Framework structure: Structure, process, outcomes

PHAB uses a combination of two frameworks to assess public health systems, including: 1) *the Foundational Public Health Services* (FPHS); and 2) the *10 Essential Public Health Services* (10 EPHS) (37). The 10 EPHS outline the functions that the public health system should carry out in all communities. FPHS and PHAB accreditation were developed to represent a minimum package of governmental public health services that serve as a foundation for advocating sustainable funding. FPHS and PHAB articulate the essential components required for public health to effectively operate in any location (90). PHAB uses the same 10 EPHS as the NACCHO's local level framework (37,40). Each of the 10 EPHS represent a domain of the framework. The FPHS framework establishes a set of eight *foundational capabilities* and five *foundational areas* that every community should have and outlines the responsibilities of public health departments (37).

The foundational capabilities refer to the infrastructure needed to provide fair public health services: 1) Assessment & Surveillance, 2) Community Partnership Development, 3) Equity, 4) Organizational Competencies, 5) Policy Development & Support, 6) Accountability & Performance Management, 7) Emergency Preparedness & Response, and 8) Communications. These foundational areas represent the basic, community-wide public health programs and services that must be accessible everywhere to enhance community health: 1) Communicable disease control, 2) Chronic Disease and Injury Prevention, 3) Environmental Public Health, 4) Maternal, Child, and Family Health, and 5) Access to and Linkage with Clinical Care (37). The PHAB Standards and Measures are composed of 10 domains (based on the 10 EPHS) each of which contains a series of measures to assess the public health department and describes the required reference documentation, number of examples to include to address each measure. This tool indicates which measures correspond to the Foundational Capabilities in the FPHS framework (37).

The PHAB offers standards for initial accreditation and reaccreditation, which follow the same framework structure (FPHS and 10 EPHS) and guidance regarding the documents require to evaluate the measures (28). Additionally, the PHAB includes the Pathway Recognition program to prepare and assist in the accreditation pathway of public health departments not yet ready for accreditation. The assessment standards for the Pathway Recognition program follows the same framework and measure structures but with a reduced number of assessment items and elements of the FPHS related measures (91).

Many of PHAB accreditation measures are **process-oriented** since they evaluate the activities developed within PHD. For example, in Domain 5 "Create, champion, and implement policies, plans, and laws that impact health" Measure 5.1.2 is to "Examine and contribute to improving policies and laws." This measure is marked as a Foundational Capability Measure. It relates to the Foundational Capability "Policy Development and Support" from the FPHS model. The measure assesses the PHD's efforts to review policies or laws and share findings of that review to contribute to and influence the development or modification of policies or laws that impact public health. The PHAB framework does not provide a specific list of outcome indicators but within their measures, it suggests analyzing key health indicator data overall.

The PHAB's Center for Innovation guides public health departments to improve their health systems through different initiatives that include structural or capacity elements. One these initiatives is the "Capacity and Cost Assessment," which assists public health departments in evaluating their current spending and capacity, and identifying investment needs to fully implement the FPHS and transform their PHS (32). The "Capacity and Cost Assessment" is an Excel-based evaluation that describes the revenues, expenditures, self-assessment of expertise and capacities among other factors; however, we did not identify evaluation criteria or specific indicators. Furthermore, the completion of the Capacity and Cost Assessment is optional for public health departments, and it is not used for comparisons between and within states.

Integration of public health functions

As described in the previous sections, the PHAB assessment framework links its domains to the 10 EPHS.

Integration of equity

The PHAB framework acknowledges that equity is an integral aspect of all the endeavors undertaken by a health department, and it includes equity as the core of the 10 EPHS framework and as one of the foundational capabilities. In its assessment, the PHAB framework incorporates several measures that specifically align with the foundational capability of equity. For example, within Domain 5 (create, champion, and implement policies, plans, and laws that impact health), the measure "Address[es] factors that contribute to specific populations' higher health risks and poorer health outcomes" is flagged as being associated to equity. Additionally, other measures within the framework focus on integrating equity into various aspects of health departments' operations (37). For example, the framework recommends analyzing health disparities data, environmental data, socioeconomic data, stratified racial, and ethnic health disparities data. Other equity measures include factors that contribute to health challenges such as the Social Vulnerability Index. Nevertheless, a local expert suggested that, in practice, equity has not been fully endorsed in the application of the PHAB frameworks and only some aspects of this attribute are considered during the evaluations.

PHAB includes considerations regarding Tribal health departments. Public health departments are asked to provide evidence on how they work and respond to the needs of Tribal health departments. Some of the measures also include indicators that include the needs of Tribal public health departments, for example, Domain 8 ("Build and support a diverse and skilled public health workforce") includes the measure "Advance Tribal and local health department workforce development efforts." This measure aims to evaluate the initiatives undertaken by the state health departments to enhance the capabilities of the PHS by providing support to the workforce of both Tribal and local health departments. Moreover, PHAB has a Tribal supplement to help bridge its standards and measures for Tribal Health Departments; these materials were developed with Tribes.

Jurisdictional level and consideration of geographical variation

We did not identify considerations for the assessment of PHS at the different jurisdictional and geographic levels. Furthermore, the accreditation de-identified data (not linked to public health departments) is available upon request for research purposes.

Framework 4: Mobilizing for Action through Planning and Partnerships' Community

The Community Partner Assessment (CPA) is part of the NACCHO's Mobilizing for Action through Planning and Partnerships (MAPP). The CPA replaced the NPHPS's local level framework since the assessment was challenging to conduct and strongly required adapting the evaluation tool to be relevant to specific communities. The CPA aims to evaluate community partners (i.e., those involved in community health improvement within and beyond the health sector) 1) individual systems, processes, and capacities, and 2) collective capacity to address health inequities (27).

Framework structure: Structure, process, outcomes

Compared to the NACCHO's local-level framework, the CPA does not rely its structure on the 10 EPHS, although it mentions them within the assessment framework. This assessment guideline does not specify a particular framework; however, the CPA conducts a survey that collects **structure** and **process** measures. Some of the structure variables measured through the CPA framework include types of services offered, self-perceived strengths, and resources available to support MAPP including the availability of interpretation and translation to make services accessible, and staffing demographics. Regarding the process measures, the CPA survey collects information on the types of advocacy work, community assessments conducted, and investigation of hazards among others (27). The survey collects answers in multiple options and open text formats.

Integration of public health functions

The CPA survey identifies organizational capacities by classifying the activities of partners related to the 10 EPHS. Partners or organizations are asked to select all the EPHS that align to their activities (27).

Integration of equity

The CPA assessment mentions the concept of equity throughout their activities with partners and its survey. For example, one of the suggested activities to conduct with participating partners is to define health equity. Other examples include questions in the survey that ask about whether the organization works on topics related to health equity, has dedicated staff addressing this area, analyze data with a health equity lens, among others (27).

Additionally, the CPA survey guidelines considers some groups to prioritize and include during the assessments since these groups can provide a more comprehensive perspective to improve the public health systems, including African American, Native American, and others (27).

Jurisdictional level and consideration of geographical variation

We did not identify considerations for the assessment of public health systems at the different jurisdictional and geographic levels within the CPA framework.

Table C6. Examples of framework indicators used in the US and in some of the state and local applications

Framework	Structure	Process	Outcome
NPHPS* (24) *State level*	**Healthcare:** health insurance coverage, provider rates	N/A	**Morbidity**: obesity, hospital utilization **Mortality**: leading causes of death, suicide, homicide **Health behaviours:** physical activity, alcohol use
Applications at state level			
NPHPS Alabama (82)	**Access to care:** rural healthcare facilities, primary care health professionals shortage areas • The number of public water systems by calendar year that had any environmental violations • Monitoring of lead in water in schools, and monitoring and adjustment of water fluoridation	N/A	**Mental health and substance abuse:** drug-related overdose, adults with depression **Pregnancy outcomes:** teen pregnancy, inadequate prenatal care **Geriatrics**: adult abuse cases, Alzheimer's disease among Medicare recipients Number of physical injuries and deaths due to heat illness Percentage of adults consuming fruit less than once per day Percentage of adults who are current smokers Percentage of adults classified as obese Cancer rate by type
NPHPS California (92)	**Access, availability, and utilization of health services:** health professional shortage area, timely care, culturally and linguistically appropriate care measured as the percentage of patients reporting difficulty understanding their provider **End of life:** access to hospital based palliative care	N/A	**Overall state of health and big trends:** life expectancy and causes of mortality by race/ethnicity and sex **Ranking of leading causes:** number of hospitalizations, number of ED visits due to asthma and top-ranking conditions (some of the main causes reported in some US states include sprains and strains, skin infections, superficial injury and contusion, and open wounds of extremities), years lived with disability **Trends in deaths:** communicable conditions, cardiovascular, cancer

Framework	Structure	Process	Outcome
NPHPS (23,30) *Local level*	**Jurisdiction and governance:** size of population served by LHDs, type of LDH governance by state **Leadership:** age of LHD top executives, highest degree obtained by LHD top executive **Workforce**: estimated size of LHD workforce, workforce composition **Finance**: annual expenditures, revenue scores, LHD budgets over time **Emergency preparedness and response:** use of select volunteer groups in emergency preparedness activities **Mobilize Community Partnerships**: maintain directory of community organizations, create forums. Convening and facilitating partnerships among groups and associations	**Monitor health status:** conducting regular Community Health Assessments (CHA), continuously update CHA (i.e., assessments that describe the community's overall determinants of health and health status, including socioeconomic and demographics, morbidity and mortality causes, quality of life, community resources, behavioral factors, environmental and other social and structural determinants of health) **Enforce laws and regulations:** review existing public health laws once every 5–15 years, evaluate the effect of policies and regulations, ensure local health depart has the authority to act in public health emergencies	N/A
Applications at local level			
Local NPHPS: San Francisco, California (83)	N/A	All same indicators as in Local NPHPS	N/A
Local NPHPS: Henrico, Virginia (84)	N/A	All same indicators as in Local NPHPS	N/A

Framework	Structure	Process	Outcome
EnvPHPS (25)	N/A	**Monitor environmental and health status**: conducting environmental health assessments, use of appropriate tools to collect, manage, and analyze data **Inform, educate, and empower:** develop communication plans, work with community to identify needs **Enforce laws and regulations**: revision of laws and regulations to assess their impact on environmental health, timely and equitable enforcement of environmental health protection laws	N/A
Applications at state level			
EnvPHPS: Florida, County overall (86)	N/A	All same indicators as in EnvPHPS	N/A
EnvPHPS: Florida, County program oriented (87)	N/A	All same indicators as in EnvPHPS tailored to vector programs	N/A

Framework	Structure	Process	Outcome
Public Health Accreditation Board	Existence of documentation such as the law or administrative rule that explains how entities perform surveillance. Public health policies and laws should reflect current public health knowledge and emerging issues	Share and review public health findings with stakeholders and the public; Anticipate, prevent, and mitigate health threats through surveillance and investigation of health problems and environmental hazards; Use health communication strategies to support prevention, health, and well-being; Adopt a community health improvement plan; Advance Tribal and local health department workforce development efforts; Ensure conducting After Action Reports (AAR) (e.g., identify AAR that indicate an overview of events or drills, strengths, and improvements); Training exercises (e.g., identify plans outlining the purpose of scheduled drills and how these will be tested)	N/A

Framework	Structure	Process	Outcome
Community Partner Assessment	Capabilities to offer services for people with disabilities, immigrants, refugees, asylum seekers; accountability; data skills	Focus of activities: e.g., including economic stability, healthcare access and quality, social and community context Organizational capabilities related to public health functions, including assessments, investigation of hazards, access to care, workforce	N/A

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