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Quantifying the Public Health Workforce for Hawai'i: Current Data, Measurement Complexities, and Conceptual Frameworks for Next Steps

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Abstract

The public health workforce is critical to community well-being and too often overlooked. The goal of public health is to prevent disease, promote health, and protect the public from current and emerging health threats. This work is vital to the health, safety, security, and prosperity of all communities and requires an adequate workforce. Despite the well-articulated gaps in the clinical health care workforce, Hawai'i's public health workforce needs and capacities are not as well understood. Public health workforce enumeration is complex. The field lacks a consistent definition of its full workforce and agreed-upon mechanisms for measuring it. Resolving these issues is an active area of scholarship and action, particularly given the COVID-19 pandemic-induced workforce capacity strain. This article reviews existing literature on public health workforce enumeration as a step toward filling this knowledge gap for practical use in the state of Hawai'i. Specifically, using a critical literature review method, this article (1) consolidates existing data about Hawai'i's public health workforce, (2) summarizes public health workforce measurement challenges, (3) shares existing frameworks and models for quantifying the public health workforce, and (4) discusses next steps to provide actionable information for ensuring Hawai'i's public health workforce can fulfill its mission. The article confirms that core public health functions as articulated in the (a) updated 10 Essential Public Health Services framework and (b) Foundational Public Health Services framework provide useful guidance for public health workforce enumeration in Hawai'i. The article also concludes that the US Department of Health and Human Services (HHS) definition of public health workers provides comprehensive framing for this enumeration. Based on this literature synthesis, a descriptive figure of the public health workforce in Hawai'i was developed to guide future work and prioritization.

Abbreviations/Acronyms

ASTHO = Association of State and Territorial Health Officials
CBO = community-based organizations
CDC = Centers for Disease Control and Prevention
DHRD = Hawai'i State Department of Human Resources
EPHS = Essential Public Health Services
FPHS = Foundational Public Health Services
HDOH = Hawai'i State Department of Health
HHS = US Department of Health and Human Services
NGO = non-governmental organizations
PH = public health
PHW = public health workforce
PH WINS = PH Workforce Interests and Needs Survey

Introduction

The goal of public health (PH) is to prevent disease, promote health, and protect the population from current and emerging health threats.[1] This work is vital to the health, safety, security, and prosperity of all communities and requires an adequate number of competent PH workers. The United States' public health workforce (PHW) has long been undervalued, underfunded, and/or understaffed, with numerous calls for substantial additional investments and innovations.[2] These calls escalated in the wake of the COVID-19 pandemic.[2]

While Hawai'i's clinical health care workforce needs and shortages are well documented,[3,4] those in the PHW are less understood. Comprehensive enumeration of the PHW is challenging,[1,5,6] both due to the lack of a consistent definition of the workforce, which can be both dynamic and wide-ranging, and the lack of an established methodology for PHW enumeration. Yet quantifying the PHW is critical to understanding current and future needs and gaps in order to ensure the PHW is capable of meeting its mission.

An understaffed PHW, like an under-staffed clinical health care system, puts the health and well-being of Hawai'i at risk. Some examples of an understaffed PHW include delayed or inadequate responses in communicable disease control, environmental health threats, delayed public communication, or slowing the advancement of health equity in our state.

This article reviews the literature on PHW enumeration to address this knowledge gap for the state of Hawai'i. Specifically, this article: (1) consolidates existing data about Hawai'i's PHW, (2) summarizes PHW measurement challenges, (3) shares existing frameworks and models for quantifying the PHW, and (4) discusses next steps to pro-

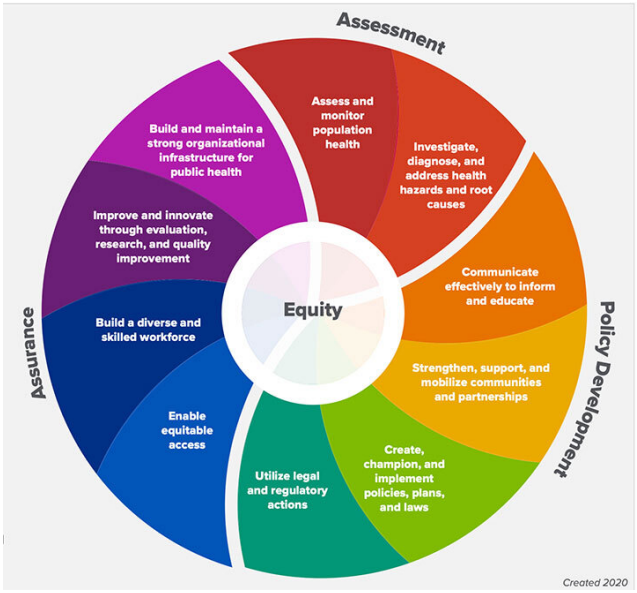

Figure 1. Revised 10 Essential Public Health Services Framework[9]

vide actionable information for ensuring an adequate PHW in Hawai‘i, now and in the future.

Methods

The authors conducted a critical literature review[7] utilizing 3 types of sources to the date of December 2024. First, PubMed was used to identify relevant articles in 2 categories: (1) literature on this topic in Hawai‘i and (2) state-of-the-art PHW enumeration models, frameworks, or data. Second, as this topic engages applied PH, which may prioritize resources other than peer-reviewed publications, the grey literature was searched using relevant keyword Google searches. Finally, the authors drew upon the interdisciplinary, applied expertise of the authorship team and their professional networks.

To delineate the PHW, a PHW definition was needed to reliably and clearly encompass those whose roles, expertise, and place of employment contribute to core PH functions both in governmental agencies, such as state health departments, and in non-governmental sectors such as community-based organizations (CBOs), academia, and health care. Although much PH enumeration prioritizes governmental PH, it is critical to quantify PH workers in all sectors.[8] The scope of PH was defined using 2 widely-used frameworks that articulate core PH functions. The 10 Essential PH Services (EPHS) takes a broad perspective of the PHW across settings and specifies assurance, assessment, and policy development as essential service areas, with equity at the center (**Figure 1**).[9] The Foundational PH Services (FPHS) framework[10] focuses on governmental PH. FPHS separates foundational areas from foundational capabilities, again identifying equity as cross-cutting (**Figure 2**).[10]

Results

Existing Data on the PHW in Hawai‘i

As summarized in **Table 1**, limited recent data quantifies the full PHW in Hawai‘i. Most data sources focus exclusively on governmental PH. One source looks at the PHW broadly, including non-governmental PH. Even when describing the same workforce, the data sources use different definitions for the PHW, count positions differently, and describe different time periods, resulting in variations. This underscores the complexity of this measurement process.

Hawai‘i State Department of Health (HDOH) Size and Vacancy Information: According to a HDOH report, as of November 2023, there were 2 927 funded positions at HDOH, including 860 vacancies (29% vacancy rate).[11] This source lists vacancies by roles, reporting high numbers of vacancies in mental health and laboratory technicians, social workers, behavioral health, and managers. This variety showcases the complexity of using a single domain, such as job title, to identify the PHW when there are many additional factors to consider.

Hawai‘i State Department of Human Resources (DHRD) Vacancy Report: DHRD is mandated to provide vacancy data to the state legislature on state departments and agencies, including HDOH. Public sector employees in Hawai‘i in permanent positions have defined retirement benefit packages by age, service period, and date of hire that can be used to estimate eligibility for retirement. The most recent report (December 2023) notes 2 389 HDOH employees in the DHRD personnel system, of which 27.3% are eligible to retire by June 2028.[12] This report is not designed to enumerate the full PHW, but it is useful for consideration in a critical review of this process as a regular report that quantifies upcoming anticipated gaps on this workforce.

Association of State and Territorial Health Officials (ASTHO) State PH System Profile. ASTHO creates regular profile reports of state PH systems. From 2022 data (last updated in December 2023), ASTHO's Hawai‘i profile estimated there were 2 168 employees (excluding vacancies, temporary or contract workers).[13] ASTHO 2022 data estimated that 476 out of 2 644 positions (18%) were vacant, putting the state in the highest quartile of percent vacancies.[13] ASTHO noted HDOH had a temporary to regular staff ratio of 2.9 to 10, ranking Hawai‘i as the third-highest quartile of state health departments for temporary workers.[13] The ASTHO profile further states that the number of PH employees in Hawai‘i decreased from 189.8 per 100 000 population in 2019 to 150.5 per 100 000 population in 2022.[13]

Hawai‘i PHW generally. A peer-reviewed paper by Braden et al (published in 2017 with data collected in 2015) estimated the total Hawai‘i PHW, including non-governmental sectors, had between 3 429 to 3 846 workers, depending on how the PHW was defined.[14] Authors estimated that a range of 317 to 502 will be needed but that when adjusting for undercounting, a range of 1005 to 1664 PH employees would be needed in the 5 years following the publication to ensure an adequate local PH system.[14] The publication pro-

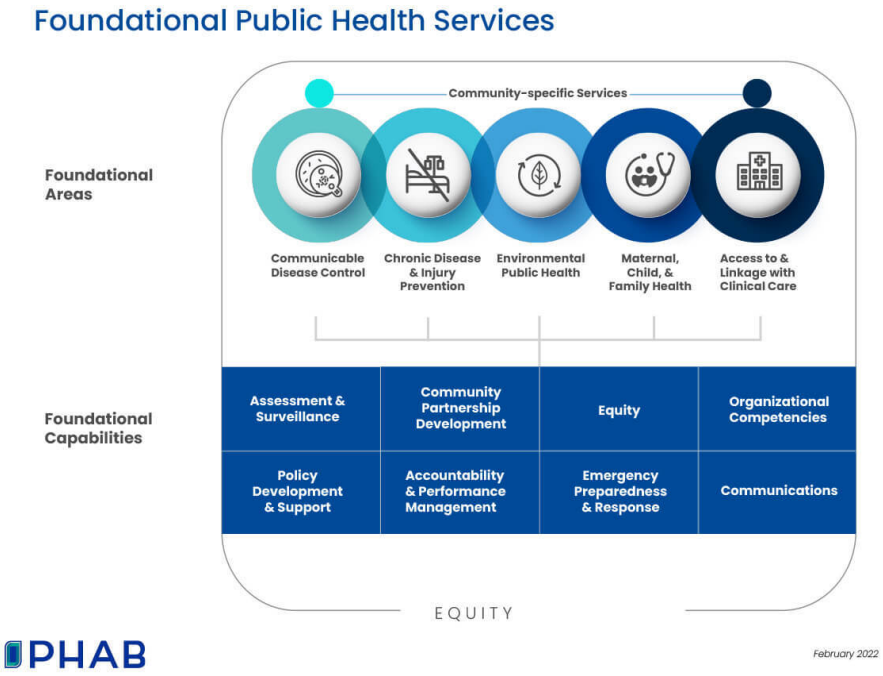

Figure 2. The Foundational Public Health Services[10]

Table 1. Existing Recent Evidence on Public Health Workforce (PHW) Size in Hawai'i

Source	Type of Position	Date of Estimate	Estimated Number of Positions	Vacancies	Vacancy Rates
HDOH[11]	HDOH permanent positions	2023	2927	860	29% unfilled
DHRD[12]	HDOH Employees in DHRD personnel system	2023	2389	652 eligible to retire by 6/30/2028	27.3% eligible to retire
ASTHO[13]	HDOH positions (non-temporary or contract)	2022	2644	476	18% unfilled
ASTHO[13]	HDOH temporary positions	2022	766.8 (2.9 to every 10 regular positions)	N/A	N/A
Braden et al PHW Survey[14]	PHW generally	2015	3429 – 3846	317-502 estimated from reported and projected vacancies, but could be as high as 1005-1664.	9%-46% estimated relative to needs

ASTHO = Association of State and Territorial Health Officials
DHRD = Hawai'i Department of Human Resources Development
HDOH = Hawai'i Department of Health
N/A = Not applicable

vided an estimated gap range for the PHW between 9-46%, depending on the definition of future need.

PHW Interests and Needs Survey (PH WINS).[15] The PH WINS national survey (conducted in 2014, 2017, 2021 and 2024) measures "strengths and gaps to inform future investments in funding, training, recruitment, and retention" in the governmental PHW. PH WINS is the only national, individual-level survey of the governmental PHW. Hawai'i has participated in PH WINS since 2017 and is in the Region IX and the state health department aggregated data reports. From these distinct measures, the vacancy rates and

projected needs indicate strains in this workforce and reinforce the need for detailed enumeration to identify specific gaps and prioritize solutions. State-level detail for Hawai'i (not previously reported) will be reported from 2024 data, contingent on adequate response rates. Of relevance to Hawai'i, this report provides detail on the need for greater diversity in this workforce to better represent the communities served, including the stark underrepresentation of Native Hawaiians and Pacific Islanders in this workforce.[15]

PH Workforce Measurement Complexities

Given current and anticipated vacancy rates as well as the critical responsibilities of the PHW, improved enumeration is needed. However, defining the boundaries of the PHW is challenging.[14,16-20] The authors discuss these complexities in 3 categories: defining the workforce, establishing an appropriate sampling frame, and dynamic considerations (**Table 2**).

Defining the PHW. In contrast to many health care professions, no licensures or job titles readily define the workforce that performs essential PH services. While models and methods exist for enumeration, the PHW full scope and scale, including all relevant roles and sectors, is not counted or classified nationally. For instance, a Centers for Disease Control and Prevention (CDC) career website indicates more than 170 PH job categories, including biologists, epidemiologists, audio-visual production specialists, web developers, and health informatics specialists.[19] All have distinct training pathways and markers of expertise. While some have PH educational degrees, others have varied educational pathways, making counting complex. In fact, PH WINS showed less than 20% of governmental PHW nationwide completed a degree in PH.[15]

Given this, the profession or job function may not match formal academic training or licensure. For example, a Registered Nurse (RN) could provide direct clinical care or could lead disease outbreak control in a health department. Including all RNs in the PHW would lead to an overestimate. Roles such as public administrator or communications specialist are critical to PH functions, but only a minority of those employed in these job titles are in the PHW. Omitting them would lead to undercounting. Physicians and public relations specialists may join the PHW temporarily (eg, in a disaster response). This work is part of essential PH functions, but these temporary roles are captured with difficulty. Most labor data sources primarily focus on employed job title. This complicates identifying a distinct PH identity, as well as where best to measure this workforce. Using credentials or academic degrees poses similar challenges.

It is also important to distinguish the PHW from the health care workforce, though they may overlap. Both EPHS and FPHS identify core PH functions as access to health care services, rather than health care services themselves. Enumeration of the PHW must make this distinction in gathering data from health care service providers, to capture only the "PH portion" of their health workforce. Yet there are also important areas of overlap, partnership, and collaboration across these sectors, both at baseline and in PH emergencies. At baseline, governmental PH, to varying degrees, provides direct health care services (especially behavioral health services), blurring the lines between governmental PH and health care. An enumeration methodology must be robust to these considerations as well as the dynamic grey areas between these sectors.

The authors thus believe it is more fruitful to use the federal US Department of Health and Human Services (HHS) definition of PH workers as "all those responsible for providing the essential services of PH regardless of the organization in which they work."[18] This casts a broad enough net to include academia, CBOs, and other governmental and non-governmental organizations (NGOs), as well as relevant components in health care, and is from an authoritative source. This definition includes all those performing the functions identified in the EPHS and FPHS models in Hawai'i.

Sampling considerations. A sampling frame must be identified to enumerate the workforce. The government sector is the core but not the entirety of the PHW. Nonprofits and academia have long-standing PH roles and governmental PH regularly contracts with partner agencies for some of its core functions. Additionally, there are newly emerging roles in adjacent settings (such as health care, health insurance) with particular focus on equitable access to health care that intersect with the PHW.[20] These roles often focus on "population health" which is not synonymous with "public health."[20,23,24] While some of these roles within these organizations perform essential PH functions (as per EPHS/FPHS), the vast majority falls outside of core PH.

Dynamic considerations. Emergency preparedness and response is a foundational PH function, including activation of emergency response personnel.[9] The COVID-19 pandemic produced a temporary PHW surge. This can be interpreted as an indication that baseline PH capacities nationwide were inadequate to perform a core PH function—controlling infectious diseases—and/or that, in rare but foreseeable PH disasters, the PHW will need temporary increased capacity. Enumerating the PHW, especially determining an adequate or ideal PH capacity, is made more challenging by the dynamic nature of the work and thus of the workforce.

Federal/Regional/Other Capacity. Often most visible in PH emergencies but engaged also in routine operations, PH capacity also includes federal and regional components. These can occur as part of governmental PH as well as non-governmental contracts, grants, and other formalized relationships. One important example is the roles of the CDC and CDC Foundation in COVID-19. Congress provides routine and emergency funds for CDC operations to support state/local governmental PH. The CDC Foundation was established by Congress as a non-profit that supports the CDC and its core missions. In the COVID-19 pandemic, surge capacity was delivered to local health departments through the CDC Foundation, including hiring over 3000 PH workers across the US to fill workforce gaps.[25] The role of integrated federal and regional PH workforce into state functions in routine operations and emergencies is important

Table 2. Summary of Measurement Challenges with PHW in the State of Hawai'i

Measurement Challenge	Measurement Implications
How to measure	
• No licensure or job title readily defines the workforce. • No pre-requisite educational degree to work in PH. • Diverse training modalities exist for learning PH competencies, skills, and perspectives. • Functional activities may not match training nor job title. • Part time and full time roles, permanent and temporary roles vary in benefits and career advancement and measurement.	• Self-identification may over and undercount workforce. • Individuals could self-identify as part of the PHW (or not) because of their activities or training or place or work (eg, at DOH).
Where to measure	
• The government sector is core but only part of the plausible PHW. • Nonprofits and academia have longstanding PH roles. • Newly emerging roles in clinical care and health insurance with a population health focus could be considered.	• Wide scope may make measurement too complex to be comprehensive. • Narrow scope may miss workforce. • How to decide what to include and who decides.
Dynamic consideration	
• The pandemic impacted the roles of increased need for, and loss of, governmental PH workers. • COVID-19 resulted in creation of PH positions which were temporary and thus don't represent sustained improvement. • PHW must be elastic to respond to emergencies as well as responsive to changing long-term demographic and population health needs. • Short term grant funding, in non-emergency times, often necessitates temporary or contracted PH workers. • Intermittent grant funding is a long-standing feature of PH. Temporary workers are part of the baseline landscape of the PHW but vary and may be missed in PHW enumeration.	• Decrease is probably an underestimate of the true decrease in permanent staffing. • Optimal staffing may vary and need ways to count this elasticity also.
Global considerations	
• Federal, regional, and even international entities may be relevant in PHW enumeration. • Strength of PH is in the scale, scope, and cross-sector, interdisciplinary approach to support population health. • This complicates not only measurement but also advocacy and ownership of measurement.	• Who advocates for counting this workforce? • Who defines the boundaries (government vs. academia vs other)? • Complexity of blurry boundaries may complicate a distinct PH identity and reduce advocacy and funding.
Hawai'i considerations	
• Calculators designed for local PH departments are not designed to be useful to centralized structures (like that of the Hawai'i Department of Health).[21,22] • Behavioral health services fall under the umbrella of PH.	• Could try to modify output from calculators. • Calculation data useful to prioritize hires. • There is a complexity delineating clinical services in core PH, but it is important to understand this nuance.

DOH = Department of Health
PH = Public Health
PHW = Public Health Workforce

to recognize in enumeration. While most of the CDC workforce is counted in the PH workforce definition, if not specified for inclusion in a sampling frame, only state-level FTEs may be counted.

Hawai'i-specific considerations. Hawai'i has a centralized governmental department of health (HDOH). Arguably, this facilitates PHW enumeration at the governmental level, as enumeration engages 1 governmental agency rather than many city, county, or regional agencies. HDOH includes the Behavioral Health Administration with its state mental health hospital and the associated direct clinical care workforce. This complicates enumeration in that HDOH includes staff who fall outside of the HHS definition of PHW. While neither of these features is unique to Hawai'i, they are important considerations in moving forward with enumeration.

Measurement Frameworks

The PHW could be defined based on job function (linking to HHS), setting (government, academia, NGO, health care), training (degree or credential), job classification (epidemiologist, community health worker (CHW), or some combination of these.[18,21]

Job Function. While the HHS definition focuses on the essential services of PH,[18] previous research in Hawai'i defined a PH worker more broadly as "anyone who works with groups and/or communities to protect, promote, or advance health/wellness."[14] This definition, which casts a wide net, is the source of one of the few recent enumeration sampling frames for the Hawai'i PHW and is thus included here for comparison purposes.

Setting/Employers. Most research in this area focuses on governmental PH,[18] although academia, NGOs, CBOs, and health care all have functions that fall within the HHS definition.[14] Those employed in health care settings such as hospitals, Federally Qualified Health Centers (FQHC), and insurers would largely fall outside of the PHW, with exceptions for those positions focused on fulfilling essential PH services. Previous research in Hawai'i using a broad definition of the PHW found the HDOH to be the largest employer of PH workers in the state, followed by FQHCs, educational institutions, non-profits, and CBOs.[14]

Training. Academic degrees in PH present complexities in delineating the PHW as the vast majority of those with academic PH degrees do not enter the governmental PHW and the vast majority of those who work in governmental PH do not have academic PH degrees.[26] For example, a recent study of Bachelor of Arts in Public Health (BAPH) graduates in Hawai'i found that only 1 of 98 graduates reported employment in local governmental PH.[27] More common were employment in local NGOs and health care organizations in roles such as program coordination or support staff, which may fall outside the HHS definition. National trends for academic degrees in governmental PH are similar. The 2021 PH WINS data show that nationally 17.4% of the governmental PHW has a PH degree at any level.[28] A recent study found that only 17% of employed recent PH graduates nationally were in government PH.[26]

Multidimensional Model

Given the complexities described above, a single tool is unlikely to adequately enumerate the PHW. A practical approach likely begins with prioritization of which parts of the PHW to measure given finite time, resources, and needs and clarity about what is being included in each count. Multiple phases could be useful for considering and enumerating Hawai'i's PHW.[18] As noted above, the authors believe the HHS definition best incorporates EPHS and FPHS models, while drawing appropriate boundaries around the PHW.

Table 3 synthesizes these considerations in a basic table template to support this process for the state that includes the building blocks that can be filled in with relevant information. Local government PH on the far left is the largest sector with other local sectors flowing across and regional and national relationship supporting from below. The figure provides a way to visualize overlap and collaboration between government and non-governmental sectors in core PH functions. Enumeration numbers could be added to the figure as this information is collected and/or this figure could also be filled in with specific organization or project names by classification to provide a scoping of the PHW ecosystem. It could also be used to display this information just for specific islands, topic areas, issues, or moments in time.

Discussion

Enumeration of the PHW in Hawai'i is critical for ensuring that core PH functions can be met. Enumeration includes measures of the current workforce, gaps in that workforce, and projected future needs. This information is critical to planning and implementing PH educational opportunities, job creation, and recruitment and retention throughout the PHW. This paper, with its template table, provides a framework to support future enumeration efforts, grounded in core PH functions. This is a critical time due to the attention on the PHW, including state and national investment and visioning by stakeholders for the future of PH.[26,29]

The authors have several practical recommendations. The first is to devote resources to comprehensively enumerating the Hawai'i PHW, building from national experience and the definitions provided here. Other states worked with local PH jurisdictions, other state agencies, universities, and PH institutes to quantify their local PHWs.[10, 26] Hawai'i is well-positioned for such a collaboration. PH in Hawai'i can benefit from annual updates on its workforce, as clinical health care benefits from such data.[3,4] A starting point is to build a survey instrument, modified from existing tools, to identify the landscape of the PHW from the perspective of relevant employers.[13] Hawai'i-focused enumeration tools should be designed to address significant identified data gaps, including fuller information about workforce diversity and enumeration of parts of the workforce often identified as ancillary or marginalized such as CHWs. In addition, consideration for how technology, future emergencies, politics, and need for surge capacities impact the future PHW should be included. Furthermore, location is an essential consideration when planning the PHW. Portability could be included to address future PH issues, as the fire in Lahaina demonstrated.

Previous recommendations for better enumeration included creating a public database of organizations that identify or affiliate with the PH community, convening a dedicated group tasked with the implementation of a standard classification scheme for their PH workers, and the creation of a regular data collection system for the PHW for advocacy, workforce policy and planning, and impact assessment.[13,18] Using the HHS definition of the PHW can help address these concerns.

There are many factors to consider besides simply numbers of workers, including information about diversity (eg, race/ethnicity/language/Lesbian, Gay, Bisexual, Transgender, Queer or questioning+ [LGBTQ+]). National data reveals limited racial/ethnic diversity of the national PH workforce generally and specifically in representation of Native Hawaiians and Pacific Islanders.[15] It is important to identify gaps and mark progress towards a goal of building an inclusive, representative, and culturally competent PH workforce, including supportive pathways, programs, and pipelines to PH.[27,30]

The critical review method was a strong fit for this project as it is, by design, a search informed by expertise in order to synthesize information and identify gaps and next steps from existing evidence on a focused research question. However, the critical review search is also, by design, non-comprehensive given its focus on dominant themes and reliance on professional expertise for evidence prioriti-

Table 3. Template for Visualization of Building Blocks of the Public Health Workforce (PHW) in the State of Hawai'i.[a]

Core Public Health Functions						
Government Public Health Positions			Non-Gov Public Health Positions			
	Permanent	Temporary/ Surge	Community Based Organizations	Healthcare	Academia	Other
State						
Local						
Regional						
National						

[a]This template is based on the US Department of Health and Human Services (HHS) definition of public health workers at "all those responsible for providing the essential services of public health regardless of the organization in which they work."[18] Enumeration numbers could be added to the figure as this information is collected and/or this figure could also be filled in with specific organization or project names by classification to provide a scoping of the public health workforce ecosystem. It could also be used to display this information just for specific islands, topic areas, issues, or moments in time.

zation and synthesis. Thus, relevant work in this area may have been missed.

The PHW is vital to community well-being. PHW enumeration is not only an academic exercise—it is a practical necessity for ensuring Hawai'i has a robust PHW. Hawai'i's PH system is under strain. Workforce questions posed before the pandemic[14] remain relevant today. These may grow as temporary workers exit and eligible workers retire. This paper provides context and practical options to consider for the important work of PHW enumeration to understand, support, and grow this vital workforce.

Disclaimer for JB

Views expressed are those of the author and not necessarily those of the Hawai'i Department of Health.

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