

Agenda Item 5:

Supply & Demand Modeling

Facilitator: Boston Consulting Group



Agenda

Agenda

Health Workforce Overview: Problem Statement & Voice of the Worker (9:10-11:00am)

- Introduction to health workforce shortages
- Panel discussion with practicing nurses & behavioral health professionals

Barriers, Stakeholders, and Role of HCAI (11:10am-12:40pm)


- Known barriers that lead to shortages
- Players across the ecosystem
- Role of HCAI
- What we know today about supply shortages & demand

Supply & Demand Modeling (1:40pm-3:10pm)

- Prioritized use cases for tool
- Overall calculation approach, functionalities, and data required
- Data gaps and key assumptions underpinning model

Our ask of you

Engage in discussion, ask questions, and share relevant knowledge

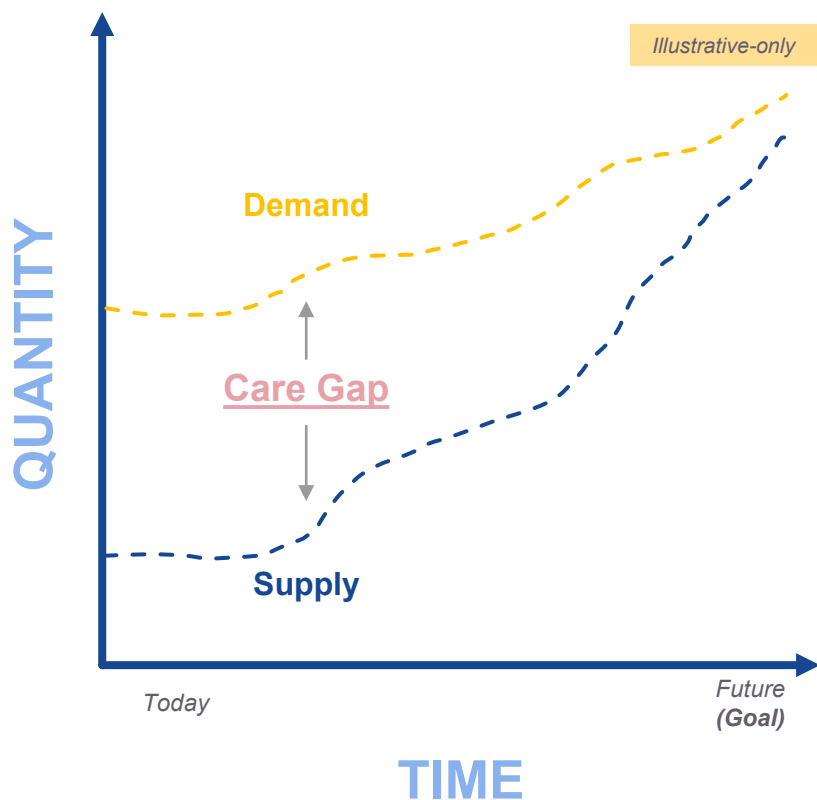
A hand holding a brass compass against a background of a mountain range. The compass is open, showing the dial with cardinal directions and degree markings. The background is a blurred landscape of green hills and mountains under a clear sky.

Our objectives for the health workforce model

- Become a **leader and go-to source** for the health workforce supply and demand; serve as an **exemplar within California and nationwide**
- **Address health workforce shortages** before they emerge
- Drive **better and more targeted decision-making** for our funds and programs
- **Identify opportunities for collaboration** with other institutions and partners to solve identified gaps

Recall: Getting the right care to the right people starts with a robust understanding of supply, demand, and pipeline

Supply currently lags demand in today's complex healthcare labor market ...



... with this care gap being driven by key interrelated factors:



Total roles staffed / needed by specialty



Geographic distribution of providers & disease burden



Utilization patterns
(based on delivery channels available & care-seeking behavior)



Importance of culturally competent care



Insurance coverage



Education pipeline & licensure



Attrition rates
(e.g., migration, retirement, burnout)



Creating a detailed Health workforce model enables HCAI to **develop a targeted set of interventions to close the care gap** & focus on **investment avenues with the greatest lasting impact**

Additionally, it provides a replicable model for leverage across other use cases

We are just beginning model build-out to develop clear view of care gaps

To share today

Phase I

Apr.-May



Outline model applications and data collection

- Review existing methodologies
- Prioritize potential tool use cases
- Understand data landscape

Phase II

May-Jul.

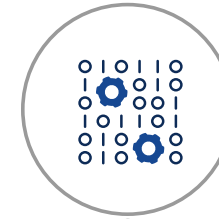


Design supply, demand, and pipeline models for behavioral health and nursing

- Design initial model architecture
- Identify data inputs
- Develop data refinement roadmaps

Phase III

Jun.-Aug.



Build supply, demand, and pipeline minimum viable product (MVP) for behavioral health and nursing

- Design and build back-end architecture
- Refine and launch MVP product tool, including visualizations
- Test tool and gather input

Socialization

Jul. onward



HCAI's modeling methodology is distinct from others across several dimensions, enabling us to get to role & geographic-level granularity



Geographic and role granularity

Highly granular with MSSA-level output and complete coverage of HCAI's priority professions



Site-specific met demand

Calculates met demand based on site of care and ideal staffing ratios



Unmet behavioral health demand

Calculates unmet behavioral health demand based on delta between disease incidence and treatment rates



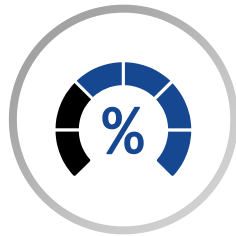
California-specific data

Key data sources are California specific, ensuring output meaningfully reflects California's health workforce and demand

Prioritized model outputs based on value and feasibility

Note: additional, secondary priority outputs to be built into tool pending time and data availability

Core model output



Supply / demand gaps, by role, geography, and time for:

- Each Medical Service Study Areas (MSSAs)
- In aggregate (*i.e., all key information aggregated in one view*)

Analysis of other sub-state gaps at county or regional levels enabled by grouping of MSSAs



Demographic lens

- See MSSAs with the highest gaps and **rural designation**
- Show supply/demand gaps by **language** within an MSSA
- Show supply/demand gaps by **race and ethnicity** within an MSSA



Insurance lens

- See share of behavioral health workers within an MSSA that **accept Medi-Cal and/or commercial insurance**

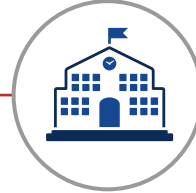
Use cases will be targeted activities in specific geos, populations, and roles such as:

Our model outputs will inform a set of future use cases

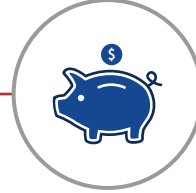
*Use case: a **practical action** (program, funding decision, partnership, etc.) **focused on areas of highest need (supply / demand gap, equitable lens)** informed by the data and analysis in our model*



Investing in programs that **increase access to and interest in health workforce roles** (e.g., apprenticeship programs, recruitment & marketing initiatives)



Partnering with educational institutions to **expand & create training programs** (e.g., increase Associate Degree in Nursing spots/acceptance criteria for students coming from key geographies)



Directly **funding scholarships, loan replacement programs, and training programs** for students from underserved communities



Partnering with labor & educational institutions to **upskill health workforce** (e.g., adult learner wraparound services)



Partnering with employers to identify health workforce / recruiting needs and **promote hiring & retention initiatives**

Over time, identified outcomes from use cases will inform future activities/interventions

We have conducted a comprehensive review of existing methodologies and data landscape to develop our proposed approach

Non exhaustive



15+ supply and demand methodologies



40+ data sources

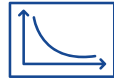
The model will use a 5-step calculation for both behavioral health and nursing



1 Calculate current supply

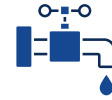
- Use license and labor data to calculate volume of providers
- Overlay demographic information from license renewal and other surveys

Some methodology differences between nursing and behavioral health in current supply & demand



2 Calculate current demand

- Use capacity, utilization, and staffing ratios to estimate current met demand for providers
- Estimate unmet demand based on health issue prevalence



3 Project supply (pipeline)

- Use education, migration, and labor data to project the future supply of providers



4 Project demand

- Apply trends in population and demographics to estimate the shift in care demand



5 Calculate supply / demand gap

- Subtract current and forecasted demand from supply
- Where negative, a labor shortage exists

All calculations will be at the most granular level possible from source data (typically MSSA or County)

We are collecting data to build MVP¹ model, but suggest future changes to ensure long-term sustainability & quality

3 main categories of data currently feed the model

Across all 3 categories, future changes would improve data & ensure sustained operability

1 **Government mandated data** (e.g., facility counts, provider license information)



- **Add additional data fields to existing collections** (e.g., utilization of psych facility beds)
- Require license holders to **list their location of practice on license renewals** and applications

2 **Population or provider survey data** (e.g., UCLA CHIS, NSDUH, DCA license renewal survey)



- **Mandate response** to the license renewal survey
- Establish relationship with 3rd party surveyors for **access to survey source data & ensure updates**
- Have **questions on key input variables added** to ongoing survey

3 **Assumptions from health workforce literature and expert input** (e.g., ideal staffing ratio for acute psychiatric beds)



- **Continually validate key assumptions** (e.g., staffing ratios) with external stakeholders
- Commission **additional studies of key variables** to refine input assumptions

Additional data would enable refinement of our current approach:

- **Health system-specific data** on provider counts and staffing methods
- **Hospital administration input** on staffing ratios
- **Educational institution data**, specifically:
 - Post-graduation location of students
 - Program admit stats, incl. rejections of qualified applicants
 - Program capacity
 - Hospital/clinic attach rates

1. Minimum Viable Product (MVP) | Note: Claims data not being pursued as key input given access challenges and lesser applicability to nursing roles (which often do not bill directly for services) and behavioral health roles (which often do not accept insurance)

Assumptions
are a critical
component of
modeling & we
will ensure our
assumptions
are as data-
driven as
possible



Every model has assumptions; no model is completely assumption-free



However, they are **informed by available data and expert insights**; assumptions are not speculation



They can **fill gaps where complete data is unavailable** or impractical to collect



They can **simplify complex systems** to enable calculations that would otherwise be unwieldy



They **enable forecasting scenarios** by providing levers that can be adjusted

Our baseline model forecast will include a set of key assumptions

Select assumptions chosen for in-depth discussion today

Non-exhaustive

Are we comfortable with these assumptions in the baseline forecast?

Additional info on following page

Assumption description	Assumption basis	Assumption validation approach
<p>BH N High</p> <p>Demand will be modeled using set staffing ratios for different care settings and provider types (e.g., X nurses per Y patients)</p>	Other demand modeling has used this approach, and it allows for a high degree of flexibility for scenarios & future changes	We are engaging experts to validate and most ratios are sourced from statute or existing literature
<p>BH Medium</p> <p>Primary care providers will provide some behavioral health services so some portion of behavioral health demand can be met by primary care providers (PCPs)</p>	We know primary care providers do some behavioral health work , the exact amount will be confirmed from literature and experts	Assess size of gap with and without primary care provider services , and confirm nature of services provided with experts
<p>BH N Low</p> <p>Further access to preventative healthcare will not decrease future acute demand (e.g., an increase in Wellness Coach supply will not decrease future acute psychiatric provider needs)</p>	The relationship may be true, but the strength of the connection would be difficult to ascertain , better to test rather than incorporate in base case	Test scenario with decreased acute demand & validate assumption with state wellness coach program

BH Assumption applies to behavioral health

N Assumption applies to nursing

Preliminary expectation of impact on gap

High **Medium** **Low**

Staffing ratios and care team composition are core drivers of model output

Ratios to be informed by statute, literature, and experts such as yourselves

For discussion:

- What is the **right care team composition/staffing ratio** for a specific role?
- What **experts can we speak** with to learn more?

Nursing | Sample care teams

1x Registered Nurse per school



1x Registered Nurse per 5 Medical/Surgical beds

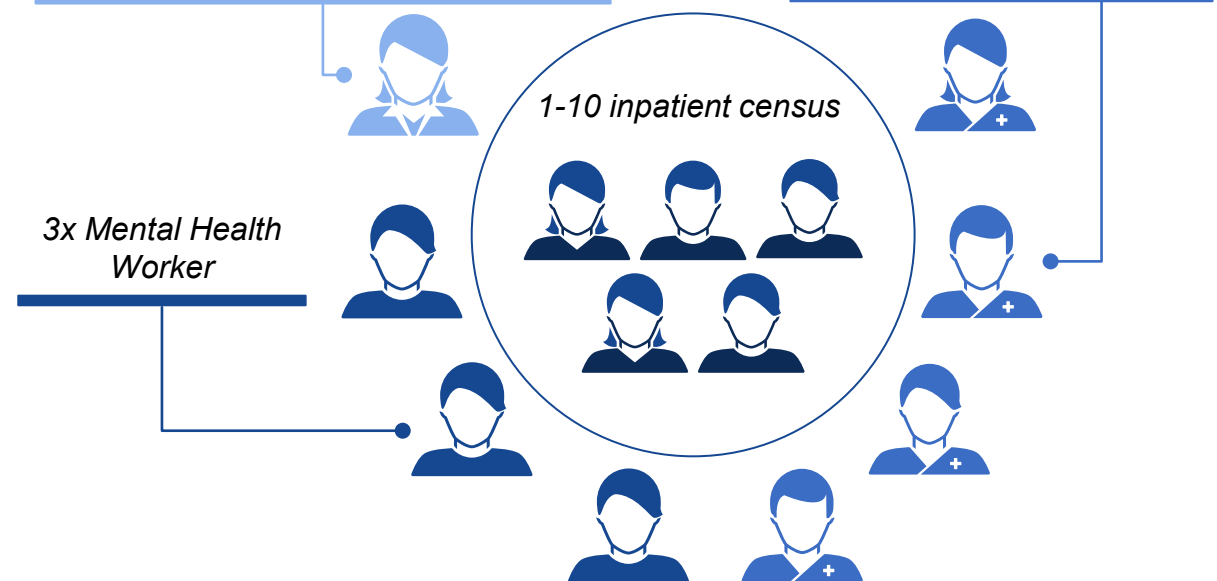


Illustrative

Behavioral health | Sample care team¹

1x Psychiatrist, Clinical Psychologist,
Clinical Social Worker, or Marriage,
Family, and Child Counselor

4x Registered Nurse or
Licensed Vocational Nurse
or Psychiatric Technician



1. Based on Cal. Code Regs. Tit. 22 Sec. 77061

There are also a set of complicating factors inherent in our modeling approach; those factors can be mitigated but uncertainty is not completely eliminated

Non-exhaustive

Supply	Mitigation approach
<p>Insurance acceptance reduces total accessible supply, particularly in behavioral health, while also impacting the care setting of treatment</p>	<p>We will use DMHC data to do an overlay of insurance provider figures on the total supply numbers we find for each MSSA</p>
Demand	
<p>Supply-driven demand, where service volume is driven by local supply of resources (e.g., beds) rather than medical necessity or patient preference</p>	<p>In our calculation methods we include a step to account for "unmet demand" to capture potentially undercounted demand</p>
<p>Unmet demand demographics likely doesn't mirror met demand demographics, in part due to variance in care-seeking behavior between groups</p>	<p>By assessing demand at MSSA level, we should see variation in demographics across geographies (just not within them)</p>
<p>Behavioral health demand is captured at the level of overall behavioral health services, not specific diagnoses or corresponding care needs</p>	<p>We can use the ratio between the population who report receiving behavioral health treatment and the provider types delivering care in that geography to partially disaggregate</p>
<p>Survey data may under-report demand for behavioral health providers, given surveys require self-reporting and many communities still have high levels of behavioral health stigma that could drive underreporting</p>	<p>Surveys being used have partially accounted for this in their sampling approach; additionally, communities with high levels of stigma likely have lower care-seeking behavior (less demand), and we can build scenarios around demand impact due to stigma level</p>
Pipeline	
<p>Not all of pipeline truly serves medical demand (e.g., Registered Nurses working in medical aesthetic clinics)</p>	<p>We can use survey and employment setting data to exclude or identify which portion of our pipeline will go into non-medical work</p>
<p>Degree earners may not enter our priority professions; degrees map to professions, but we must make assumptions about what proportion enter the provider workforce</p>	<p>We have used mapping from NCES and the HCAI team to map degrees to professions and can triangulate between license data & education degree data to evaluate the leakiness of the pipeline</p>

Baseline forecast projects supply and demand shifts, sensitivity analyses test impact of varying key inputs, and scenarios explore impact of key levers



Forecast

Default '**base case**' projection of future supply and demand that provides a **comparison point** for all other scenarios

This narrow **range** is based on **highly expected trends**

e.g., In 2034, our forecast expects a gap of 50-100 Psychiatrists in Fresno North Central MSSA



Sensitivity analysis

Demonstrates how **variance** of key inputs **impacts forecast**

Performed to **test model variance** based on changes to **highest-impact variables** and better understand model output **confidence intervals**

e.g., If we adjust the inpatient psychiatric bed ratio to be 29 (previously 30) beds per 100k pop., the gap of Psychiatrists in Fresno North Central MSSA would decrease by 10%



Scenarios

Enables exploration of **different model outcomes** based on **expected changes and/or interventions**

Should be **compared to the base forecast and to one another**

Tests **impact** of key levers by **varying inputs/assumptions** to answer '**what if**' questions

e.g., In a scenario where we implement a training subsidy program in Fresno, the local Psychiatrist supply would grow, causing the gap in Fresno North Central MSSA to decrease to 25-40 psychiatrists

Model will include several scenarios which will be selected depending on their expected impact, value to HCAI & partners, and feasibility to accurately measure

For example...



Shifts in care delivery model

How might shifts in care delivery settings, such as inpatient to outpatient or telehealth models, and broader care delivery trends, e.g., in treatment paradigm, affect roles & geographies of interest?



Shifts in care team composition

How might certain care team compositions for behavioral health & nursing roles of interest change over time?

What are potential impacts from these scenarios?

Would they impact supply, demand, or both?

Which roles or geographies would be most impacted?

Other scenarios to be considered include, but are not limited to:

- Alternative Payment Model adoption
- Tech advancement, including GenAI
- Facilities closures
- 'Expected' growth in inpatient behavioral health capacity
- Decreased acute demand due to investments in preventative healthcare
- Health workforce redistribution programs
- Non-financial completion supports
- Creation of training programs in underserved geographies
- Incentivizing skilled immigration
- Scope of practice changes
- Shortening training program duration















Appendix

Our baseline model forecast will include a set of key assumptions (I/II)

Are we comfortable with these assumptions in the baseline forecast?

Non-exhaustive

Assumption description	Assumption basis	Assumption validation approach
BH  Enough inpatient psych beds will exist to reach 'ideal' bed-to-population; in reality, behavioral health professional demand constrained by the number of existing, staffable beds	Model focuses on health workforce, incorporating facility availability introduces confounding factors and underestimates unmet need in counties with insufficient beds	Test scenario with behavioral health providers limited by facility construction & compare size of gap
BH  N  Demand will be modeled using a set of staffing ratios for different care settings and provider types (e.g., X nurses per Y patients)	Other demand modeling has used this approach, and it allows for a high degree of flexibility for scenarios & future changes	We are engaging experts to validate and most ratios are sourced from statute or existing literature
BH  N  "Default" care team composition will not change for the roles we are modeling in the baseline forecast	Any shift in care team should be modeled as a scenario , not in the baseline forecast, so it can act as a better comparison point	Work with experts to understand expected care team shifts and build scenarios to test those impacts
BH  N  Provider location is based on their license record which is self reported and could be a dwelling, not the license holder's location of practice	Many license holders do report their location of practice, and at the level of MSSA, we expect most providers will live in the location they practice	Spot check provider locations & test drive time to nearest medical facility from license addresses to see if they are near practice locales
BH  N  There is no constraint on supervisory professions (e.g., there are sufficient anesthesiologists to supervise nurse anesthetists)	Existing literature indicates gaps are larger in our priority professions , so the constraint of sufficient supervisory professions would likely not matter	Review 3rd party physician supply models to assess where there may be any gaps

BH Assumption applies to behavioral health
 N Assumption applies to nursing
 Preliminary expectation of impact on gap
  High
  Medium
  Low

Our baseline model forecast will include a set of key assumptions (II/II)

Are we comfortable with these assumptions in the baseline forecast?

Non-exhaustive

Assumption description	Assumption basis	Assumption validation approach
<p>BH ≈ Primary care providers will provide some behavioral health services so some portion of behavioral health demand can be met by primary care providers (PCPs)</p>	<p>We know primary care providers do some behavioral health work, the exact amount will be confirmed from literature and experts</p>	<p>Assess size of gap with and without primary care provider services, and confirm nature of services provided with experts</p>
<p>BH ≈ Some provider types are fungible in terms of the demand for care that they serve (e.g., a Nurse Midwife and Licensed Midwife serve similar demand) and their demand can be calculated together</p> <p>N</p>	<p>Attempting to model the demand that each individual profession is serving may introduce a degree of false precision to the output. Grouping allows for a more accurate supply / demand gap with the available data</p>	<p>Validate groupings with practitioners and external reports; confirm that any results produced by groupings are in-line with expectations</p>
<p>BH ∨ Further access to preventative healthcare will not decrease future acute demand (e.g., an increase in Wellness Coach supply will not decrease future acute psychiatric provider needs)</p> <p>N</p>	<p>The relationship may be true, but the strength of the connection would be difficult to ascertain, better to test rather than incorporate in base case</p>	<p>Test scenario with decreased acute demand & validate assumption with state Wellness Coach program</p>

BH Assumption applies to behavioral health

N Assumption applies to nursing

Preliminary expectation of impact on gap

∧ High **≈** Medium **∨** Low

Several key variables drive model output, and early alignment is needed for all

Staffing ratios



Provider-to-patient ratios

Ratios of care come from statute, literature, and experts



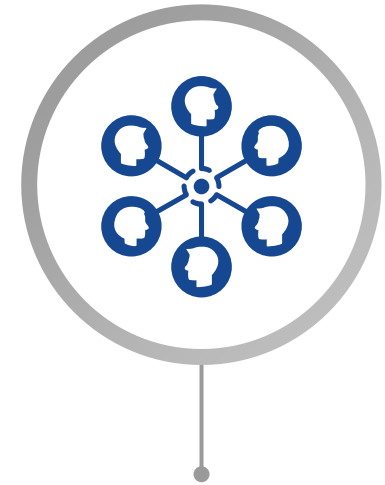
Bed-to-population ratios

Ideal bed to pop. ratios come from literature & experts, and informs behavioral health demand



License association

License association hierarchy is needed to de-duplicate licenses and providers



Population trends

Future population forecasting drives provider & serviced population values

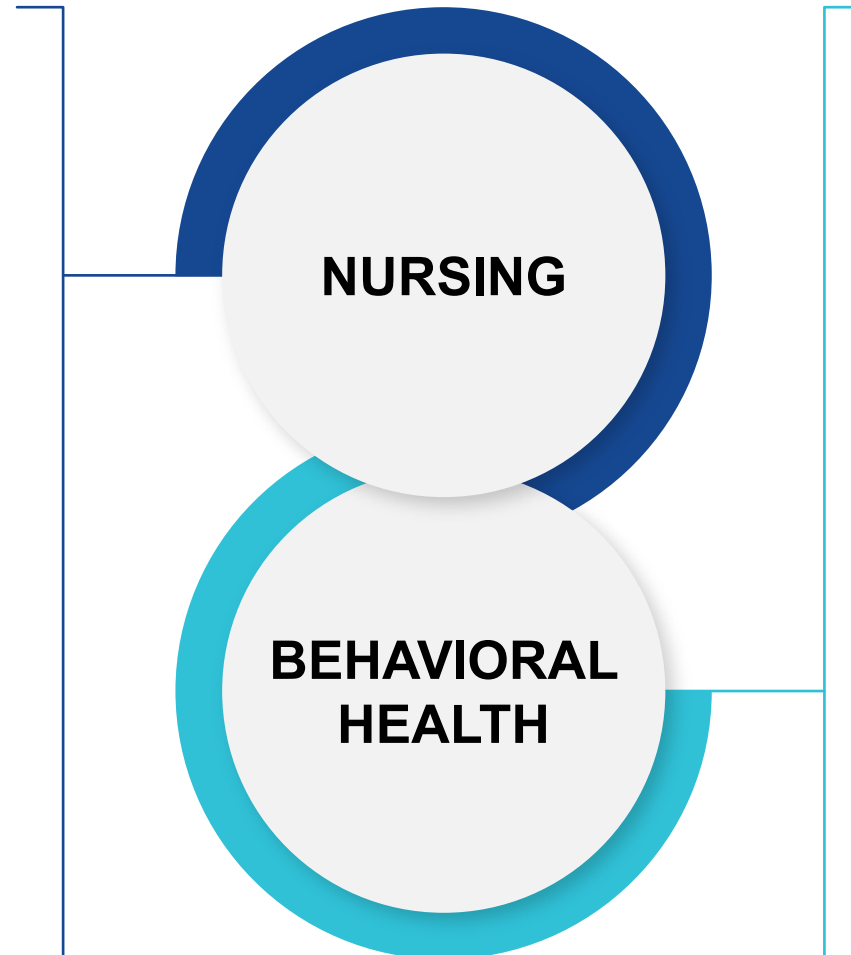
Model to be broken into distinct care delivery settings given care team composition varies by location of care delivery

Inpatient / surgical

- Hospital inpatient
- Hospital operating room
- Ambulatory Surgical Center
- Long-term care (skilled nursing facility, long term assisted care)

Outpatient

- Outpatient clinics (primary & specialty care)
- Telenursing
- Home care
- School



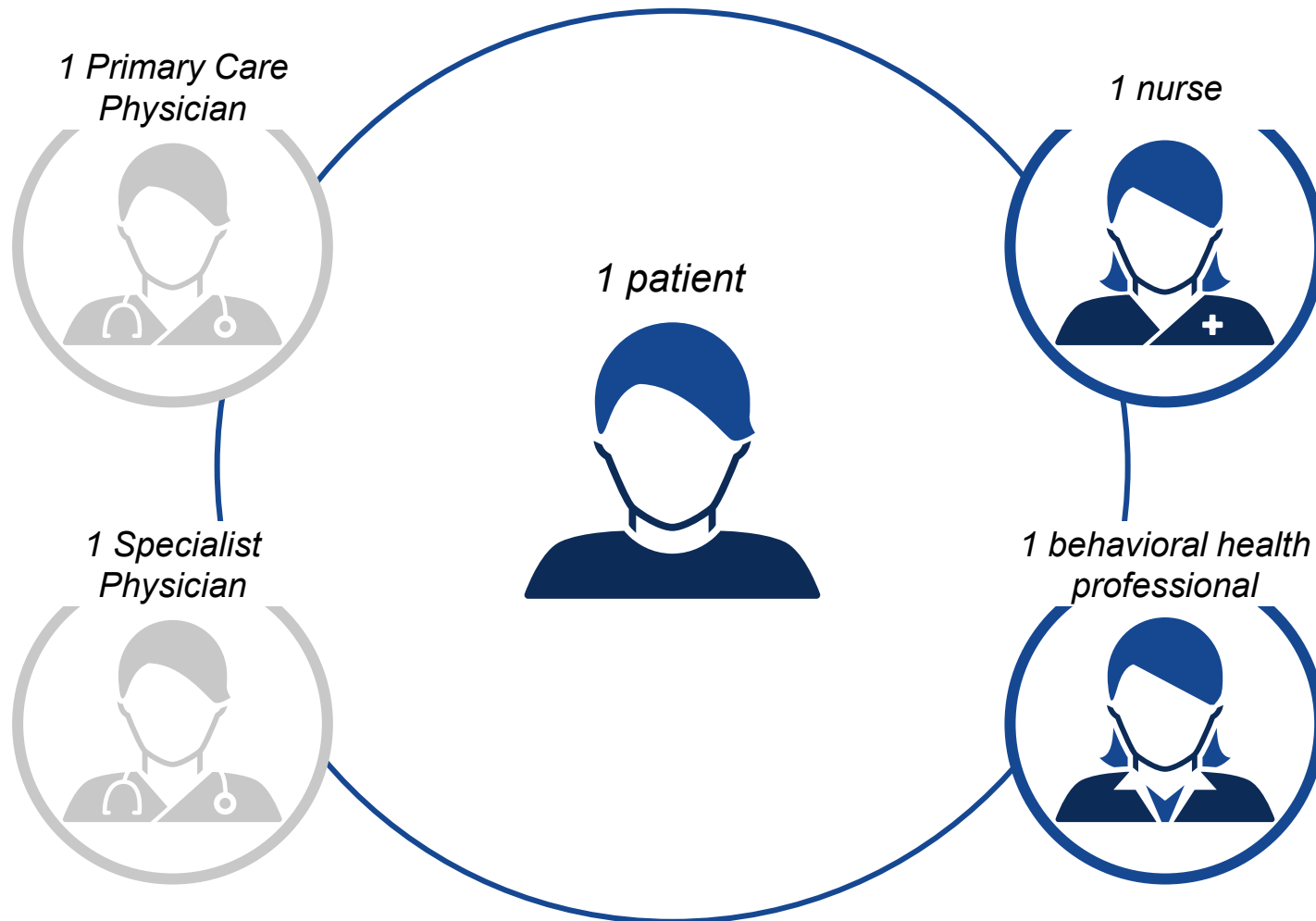
Inpatient

- Acute psych
- Subacute psych
- Residential psych
- Chemical dependency recovery (substance use)

Outpatient

- Outpatient in-person
- Telehealth
- School

Care team for a given patient will be composed of many health care professionals; our models focus on nursing and behavioral health professionals



Our models focus on **nursing** and **behavioral health**

"Care team" in the model context refers to the specific roles for which we are modeling supply and demand – not the whole ecosystem of healthcare workers that is involved in the treatment of a given patient

However, where potential changes in the broader care team composition affect roles of interest, scenarios will be designed accordingly

Illustrative, non exhaustive

After calculating current supply, demand, and pipeline by role, setting, and geography, additional variables and forecasts can be incorporated into the model

Illustrative, non-exhaustive



Potential variables



Demographics of the provider and patient populations in each geography, for example age and race/ethnicity^{1,2}



Language makeup of the provider and patient populations in each geography^{1, 2}



Unmet demand factors for selected settings and roles in Health Professional Shortage Areas (HPSAs), for example hospital closures³



Potential forecast calculations



Population trends, for example changes in the mix of age, race/ethnicity, and language of patients and/or providers⁴



Care delivery trends, for example a shift from inpatient to outpatient care or an increase in home care⁵

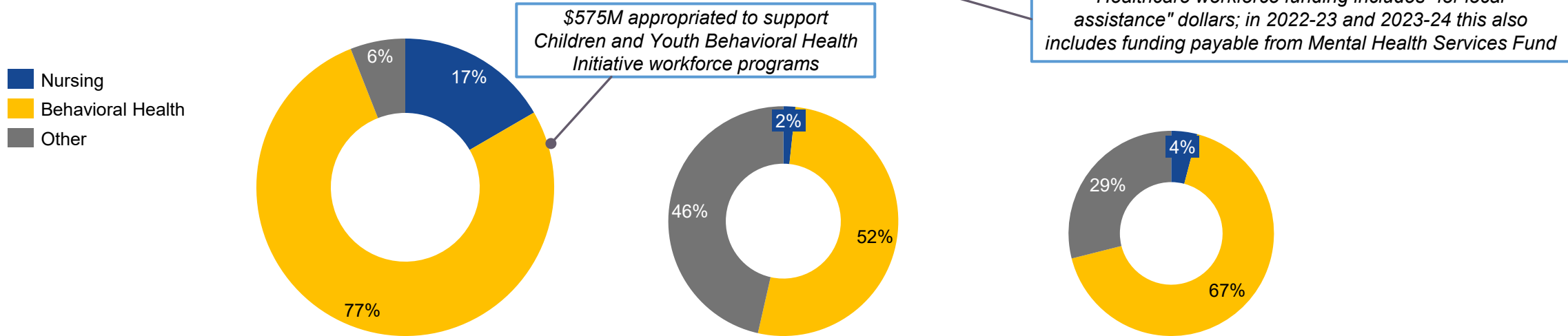


Facility infrastructure trends, for example hospital closures⁵

1. Based on US Census and provider and population survey data; 2. HCAI workforce license renewal survey; 3. Based on Health Professional Shortage Areas, scientific literature and expert input; 4. Based on CA DoF population projections; 5; Based on historical trends, scientific literatures, and expert input

Significant changes in OHWD's budget in past years; continued focus on behavioral health

Healthcare workforce funding appropriated across workforce types (%)



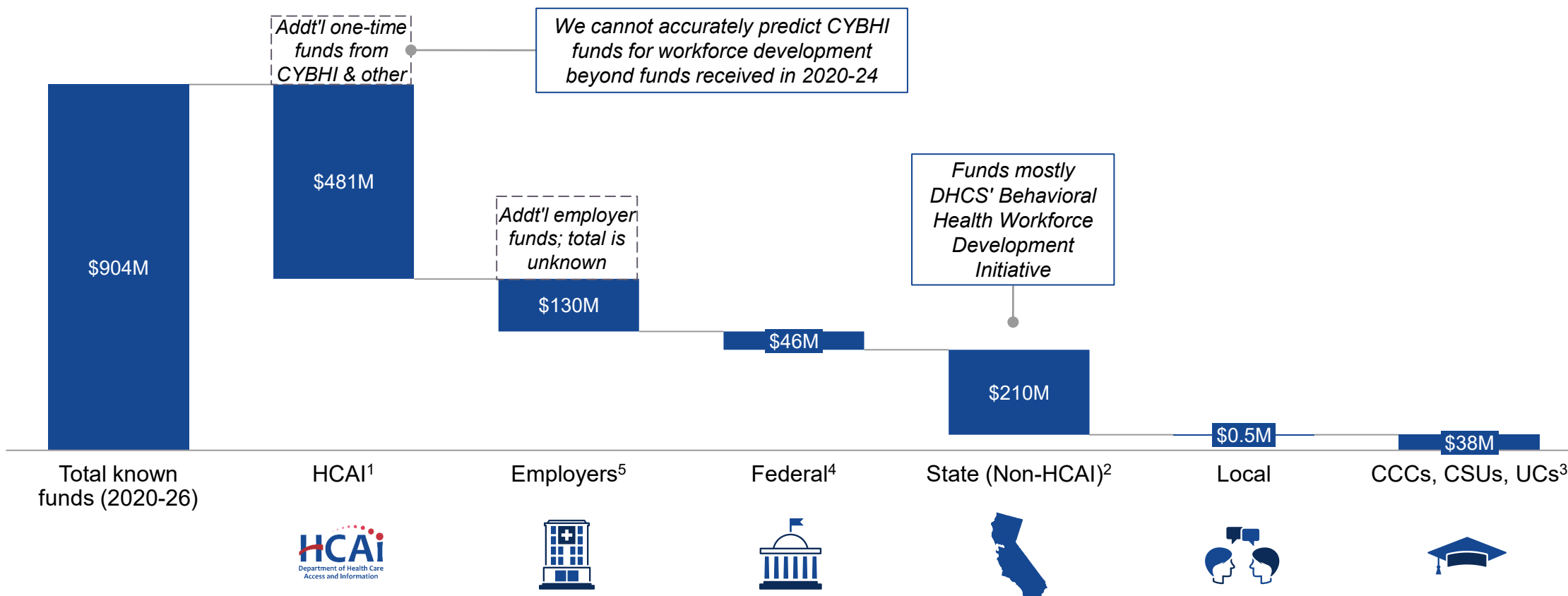
Year	2021-2022	2022-2023	2023-2024	
Total (Budget Acts)	\$743M	\$492M	\$448M	<i>eBudget amounts not equal to Budget Act since they likely also include federal grants and funding allocated to state operations</i>
Total (eBudget)	\$806M	\$604M	\$494M	
BH	\$575M (77%)	\$255M (52%)	\$300M (67%)	
Nursing	\$123M (17%)	\$8M (2%)	\$18M (4%)	
Other	\$44M (6%)	\$228M (46%)	\$130M (29%)	

Note: Total amounts from Budget Acts represented total HCAI healthcare workforce funding for local assistance specified in chaptered Budget Acts
 Source: Budget Act 2021 (AB-129), Budget Act 2022 (AB-179), Budget Act 2023 (AB-102), eBudget

Behavioral health funding | Large investments from HCAI, employers, and DHCS form majority of known one-time funding

Estimated 2020-26 known one-time funding appropriated for behavioral health workforce development in CA (\$M)

Funding dollars are estimated and only include "known" one-time funding; there will likely be additional funding in 2024-26 that is currently unknown

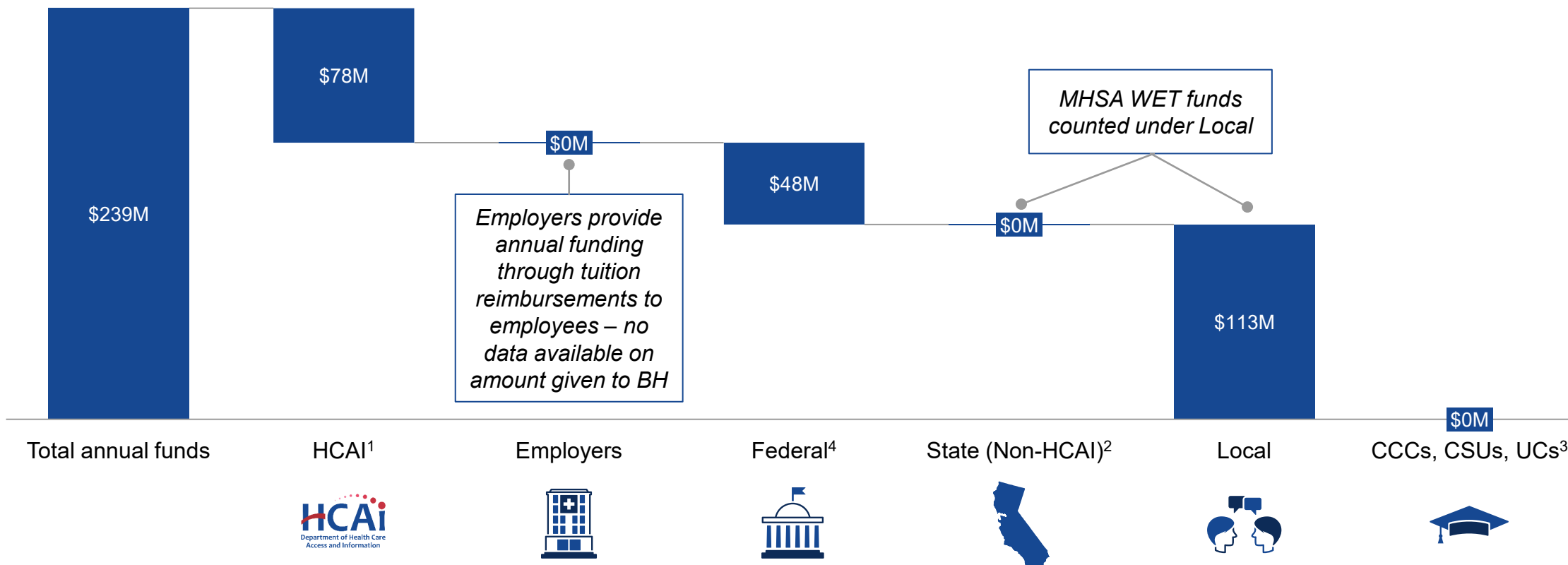


1. HCAI funding based off of average total appropriated funds from FY 20-24; 2. Does not include state funds to CCCs, which are accounted for in the "CCCs, CSUs, UCs" group; 3. Estimated that roughly 1/7 of the CCC's ELL Healthcare Pathways annual funding was awarded to BH programs; 4. Additional funds likely contributed from CARES Act and American Rescue Plan; includes BSCA funding and American Rescue Plan's Graduate BH Program; 5. \$130M is a single large investment by Kaiser
 Source: Desk research, grants and funding websites

Behavioral health funding | These one-time dollars are supplemented by \$100M+ in MHSA WET dollars

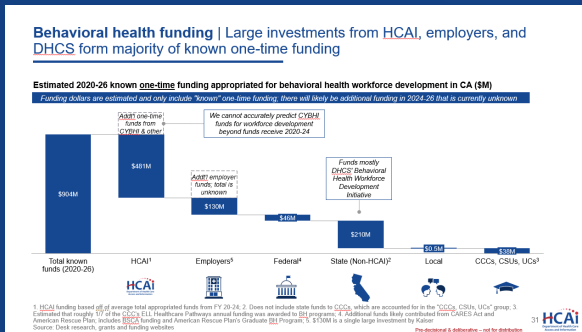
Estimated annual appropriated funding for behavioral health workforce development in CA (\$M)

Funding dollars are estimated and may not reflect all funds received across sectors



1. Based off FY 20-24 appropriated funds for Peer Personnel, PECE, Regional Partnership programs given they are largely funded by MHSA funds; 2. Does not include state funds to CCCs; 3. Estimated that roughly 1/7 of the CCC's ELL Healthcare Pathways annual funding was awarded to BH programs; 4. Based on HRSA's annual BH workforce spend; can expect add'l funding from SAMHSA, NIH, and other fed. agencies, though amounts are small relative to HRSA's funds; Source: Desk research, grants and funding websites

Key takeaways from workforce funding for Behavioral Health



HCAI: The CBO BH Workforce Grant Program and Psychiatric Education Capacity Expansion are the largest contributors to the HCAI's BH funding



Employers: Kaiser allocated \$130M via programs like Futuro Health and Mental Health Scholars Academy to expand the pipeline of qualified and diverse BH professionals



Federal: As part of the Bipartisan Safer Communities Act and American Rescue Plan, California received ~\$46M in one-time funding to develop school mental health workforce in addition to ~\$48M in annual HRSA funding



State: ~\$9M from CWDB's High Road Training Partnership Program, ~\$200M from DHCS's Behavioral Health Workforce Development Program targeted largely at SUD counselors and Peer Personnel



Local: Counties spend ~\$113M annually from MESA for Workforce Education Training (WET) programs

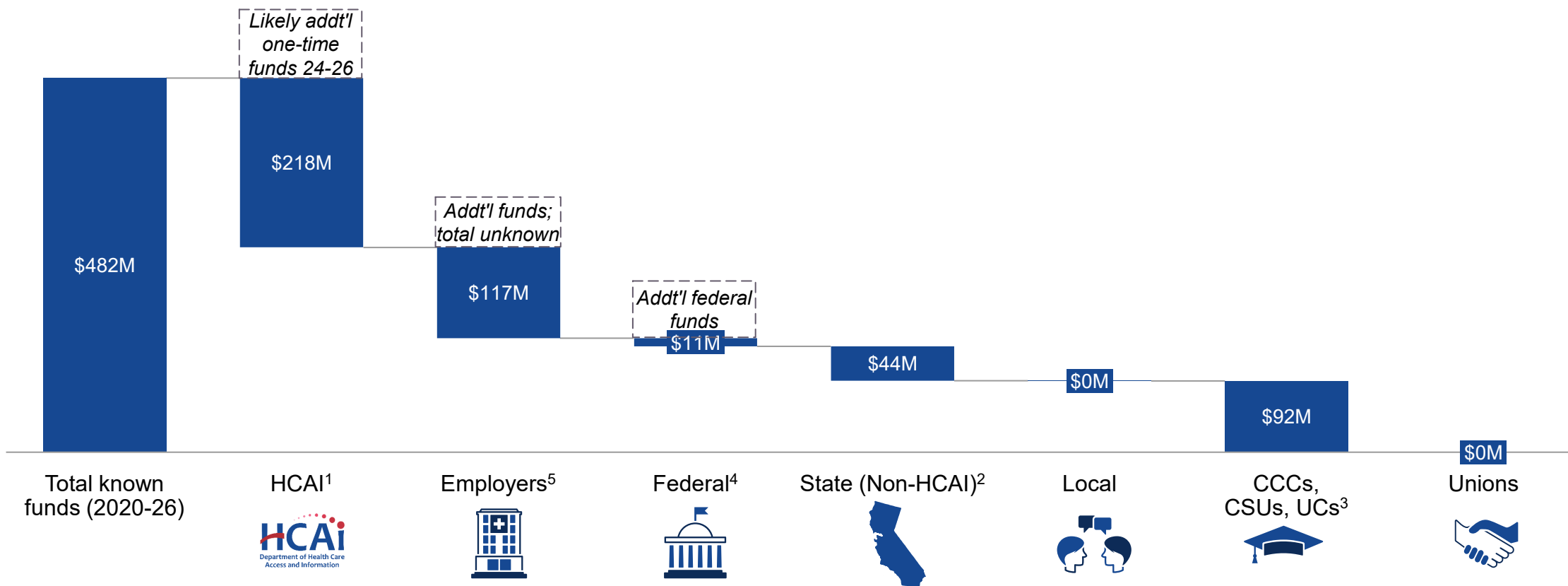


CCCs, CSUs, UCs: ELL Healthcare Pathways supports healthcare-focused vocational pathways for English language learners at CCCs, training a new generation of healthcare workers with linguistic concordance

Nursing funding | State, employers, and higher-ed institutions contributed most to known one-time funding

Estimated 2020-26 known one-time funding appropriated for nursing workforce development in CA (\$M)

Funding dollars are estimated and only include "known" one-time funding; there will likely be additional funding in 2024-26 that is currently unknown

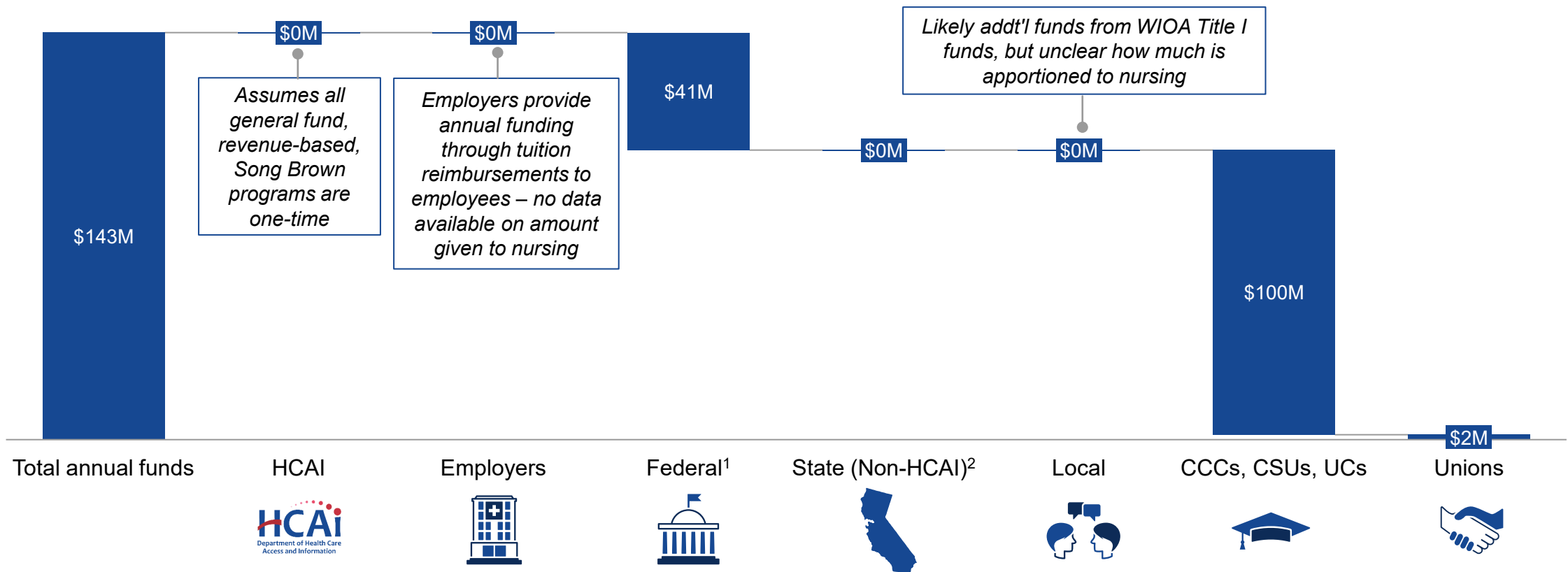


1. HCAI funding based off average funding of nursing programs from FY 20-24 ; 2. Does not include state funds to CCCs, which are accounted for in the "CCCs, CSUs, UCs" group; 3. Estimated that roughly 1/7 of the CCC's ELL Healthcare Pathways annual funding was awarded to nursing programs; 4. Federal funds estimated based off one-time funds received from the American Rescue Plan; 5. \$117M is a single one-time investment from Kaiser and CalOptima
 Source: Desk research, grants and funding websites

Nursing funding | Recurring annual funds are limited to federal funds from the Health Resources and Services Administration and higher-ed funding

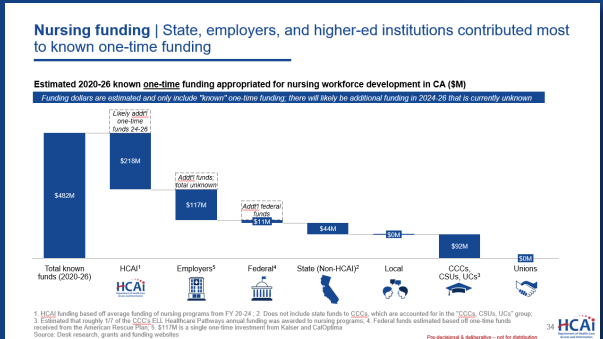
Estimated annual appropriated funding per year for nursing workforce development in CA (\$M)

Funding dollars are estimated and may not reflect all funds received across sectors



1. Based off annual nurse workforce development funding to HRSA, assumed ~12% was allocated to California
 Source: Desk research, grants and funding websites

Key takeaways from workforce funding for Nursing



HCAI: Song-Brown Suite of Programs and CNA Training Programs form majority of HCAI nursing workforce funding, though May 2024 budget revisions have greatly reduced the appropriated funding



Employers: Kaiser's ~\$100M Futuro Health program expands the pipeline of nursing professionals through scholarships and training programs; CalOptima invests ~\$17M into RN / BSN training programs at Orange County colleges



Federal: The HRSA allocates ~\$41M annually to California for nursing workforce development, with recent one-time ~\$11M funded through the American Rescue Plan



State: Majority of non-HCAI state agency funds come from CWDB's High Road Training Partnership Program



Local: Local agencies largely receive and use funds from other sources (i.e., WIOA) but do not provide additional dollars



CCCs, CSUs, UCs: Governor's budget proposed \$60M annual increase in nursing program funds for CCC's from FY 24-29, with ~\$100M apportioned annually



Unions: SEIU Local 1000's nursing funds ~\$2M annually toward LVN to RN apprenticeship programs