Research Report

California's Primary Care Workforce: Forecasted Supply, Demand, and Pipeline of Trainees, 2016-2030

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Abstract / Overview

California will likely face a statewide shortfall of clinicians in the next 15 years. Some regions may face greater shortages than others because providers are not evenly distributed across all regions of the state. Using standard forecasting techniques, the authors forecast the supply of primary care clinicians (MDs, NPs, and PAs) through 2030 in California and for five regions: the Greater Bay Area; the Sacramento, Sierra, and Northern Counties; the Central Valley and Central Coast; the Los Angeles, Orange, and Inland Empire; and the Southern Border. Demand for primary care was projected using four distinct benchmarks to provide a range of plausible demand estimates. In 2030, California is projected to have 78,000 to 103,000 primary care clinicians (approximately 34,000 to 46,000 full time equivalent clinicians (FTEs). By 2030, NPs and PAs will comprise nearly half of California's primary care clinicians. Californians are projected to demand 12%-17% more primary care clinician FTEs by 2030. Mid-range forecasts indicate that California will have shortages of primary care clinicians in 2025 and 2030 and would need approximately 4,700 additional primary care clinicians in 2025 and approximately 4,100 additional primary care clinicians in 2030 to meet demand. High range forecasts suggest that California could have a small surplus of primary care clinicians in 2030; however, this seems unlikely because training programs would likely heed market signals and reduce the number of trainees and because trainees may elect to pursue opportunities in specialty care instead of primary care. The Central Valley and Central Coast region and the Southern Border region are projected to have the worst shortages. California needs to closely monitor the supply of primary care clinicians and to develop strategies to fill potential gaps between supply and demand that may arise as soon as 2025.

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Executive Summary

In the next 15 years, California could face a substantial shortage of primary care clinicians. The number of physicians completing primary care residencies in California does not appear adequate to replace primary care physicians who are likely to retire in the coming decade. Although there has been rapid growth in the nurse practitioner (NP) and physician assistant (PA) workforces, their numbers are still small relative to the number of physicians. Furthermore, many NPs and PAs do not practice in primary care settings. In addition, the distribution of primary care clinicians across regions of the state is uneven.

This report presents findings from forecasts of future supply and demand for primary care clinicians in California that will help policymakers, clinicians, and leaders of educational institutions identify potential shortfalls in supply and develop strategies to address them. It is the second in a series of three reports from Healthforce Center at the University of California, San Francisco on the supply and demand of primary care clinicians in California. The first report in this series described the supply, distribution, and demographic characteristics of California's primary care clinicians (Coffman, Geyn, Himmerick 2017). The third report will provide additional information about strategies for increasing primary care clinician supply that are being implemented in California and other states.

Methods

The report presents forecasts of supply and demand for allopathic physicians (MDs), NPs, and PAs in California through 2030. Forecasts were not generated for osteopathic physicians (DOs) due to the limited amount of data available about them. For purposes of this report, primary care encompasses family medicine, general internal medicine, general pediatrics, and obstetrics/gynecology. Forecasts presented in this report were developed for the state as a whole and for five regions: Greater Bay Area; Sacramento, Sierra, and Northern counties; Central Valley and Central Coast; Los Angeles, Orange, and Inland Empire; and Southern Border.

Supply Forecasts

The supply forecasting method used for this report is commonly called a "stock-and-flow" model. The number of primary care physicians, NPs, and PAs licensed and living in California is the "stock" of clinicians available to provide primary care services. Inflows of clinicians, such as new graduates and physicians who relocate to California, are added to the stock of clinicians while outflows, such as retirements, are subtracted. Estimates of the labor supply of clinicians are computed from the stock of clinicians potentially available to work in primary care. This number is expressed as full-time equivalent (FTE) employment in order to account for differences in the work commitments of clinicians employed full-time and part-time. Estimates of work effort were generated separately for men and women and for physicians who are under 40 years, 40-60 years, and over 60 years old. For each profession, three to four forecasts of supply were generated based on different assumptions about the rate of growth in graduations from training programs (1%, 3%, 7%) and, in the case of PAs, different assumptions about the percentage of clinicians providing primary care (26% vs. 37%). For MDs and NPs, a single assumption about the percentage of clinicians providing primary care.is derived from surveys administered by their respective licensing boards.

Demand Forecasts

For this report, four different measures for benchmarking demand (or need) for primary care clinicians were used to generate forecasts in order to develop a range of plausible estimates of future demand. The four benchmarks are:
- Maintaining a stable ratio of employed primary care clinicians per 100,000 population, based on the average California ratio of primary care clinicians.

- Maintaining a stable ratio of employed primary care clinicians per 100,000 population, based on the average US ratio of primary care clinicians.

- Growing demand for physician visits as population grows based on current utilization of physician visits by age group, as reported in the California Health Interview Survey (CHIS).

- Projected utilization of primary care clinician FTEs based on national utilization, as used by the Health Resources and Services Administration (HRSA) in its 2013 primary care forecasting report (HRSA 2013).

The demand forecasts are based on estimates of use of physician services in 2015 after implementation of the Affordable Care Act (ACA) substantially increased the number of Californians with health insurance. Utilization of physicians may differ in the future because greater insurance coverage is associated with greater demand for primary care and other health services. Repeal or substantial retraction of the ACA could reduce insurance coverage and thus demand for health care services. However, a growing number of primary care clinicians are reimbursed through value-based payment models, which may increase demand for primary care relative to specialty care.

The demand forecasts are also based on the assumption that an NP or PA FTE is equivalent to a MD FTE. Separate projections of demand were not generated for each type of clinician because there is variation within California and across the U.S. in the ratio of each type of provider to the others, and there is no consensus that any specific mix of types of clinicians is preferred. However, some specific populations, such as persons with complex conditions, may need more care from physicians. To the extent this occurs, the demand forecasts may overestimate the degree to which NPs and PAs can fill the gap between physician supply and demand for primary care services.

Findings

Supply Forecasts

- By 2030, the supply of primary care clinicians in California is projected to range from approximately 78,000 to 103,000 clinicians (approximately 34,000 FTEs to 46,000 FTEs) depending on assumptions about rates of growth in graduates of training programs and the percentage of new graduates who provide primary care.

  - The supply of primary care MDs is projected to decrease between 8% and 25% because insufficient numbers of new primary care MDs are completing residency programs to replace physicians who are projected to retire.

  - The supply of primary care NPs is projected to increase between 82% and 157%.

  - The supply of primary care PAs is projected to increase between 64% and 127%.

- At the regional level

  - The Southern Border region is projected to have the greatest decrease in primary care physician supply.

  - The Los Angeles, Orange, and Inland Empire region is forecast to have the largest increase in NP supply.

  - The Sacramento, Sierra, and Northern Counties region is projected to have the largest increase in the supply of PAs and the smallest increase in NP supply.

Demand Forecasts

- By 2030 California is projected to demand between 39,331 and 44,188 primary care clinician FTEs, an increase of 12% to 17% above the current demand.

- Estimates of future demand vary depending on whether they are based on utilization of primary care clinicians in California or the United States.

- The Greater Bay Area region; the Sacramento, Sierra, and Northern region; and the Central Valley and Central Coast regions are projected to have higher rates of growth in demand for primary care clinicians than California overall.

- The Los Angeles, Orange, and Inland Empire region and the Southern Border region are projected to have lower rates of growth in demand for primary care clinicians than California overall.

Adequacy of Supply and Demand

- The estimates of future supply and demand for primary care clinicians suggest that California will either have a shortfall of primary care clinicians in 2025 and 2030 or a small shortage of clinicians in 2025 and a small surplus in 2030, depending on the assumptions that are made about:
  - Rates of growth in the number of new MD, NP, and PA licensees;
  - The percentages of MDs, NPs, and PAs who provide primary care; and
  - Trends in utilization of primary care services.

- Regional estimates of the adequacy of supply are consistent with statewide estimates.

Conclusion

- Physician supply will decline between 2016 and 2030 in nearly every supply scenario estimated.

- By 2030, NPs and PAs will comprise nearly half of California's primary care clinician FTEs.

- Although California could have a small surplus of primary care clinicians, we believe this is unlikely to occur. If the supply of primary care clinicians begins to exceed demand, educators are likely to reduce training capacity, new graduates will be more likely to pursue opportunities in specialty fields, and migration of primary care clinicians to California will decrease.

Recommendations

- Multiple strategies at national, state, and regional levels will be required to fill the potential gap between primary care demand and supply, including:

    - Actively recruiting primary care physicians to practice in California.

    - Expanding primary care residency programs, particularly in the regions most at risk for long-term shortages.

    - Improving retention of physicians, particularly younger physicians.

    - Ensuring 3-7% annual growth in graduations from NP and PA education programs so that the number of graduates keeps pace with projected demand.

    - Expanding team-based primary care models that maximize the use of all clinicians and supporting alignment of insurance reimbursement with team-based care.

    - Ensuring that scope-of-practice regulations for NPs and PAs maximize their capacity to provide primary care and to work at the highest level of their education and knowledge.

Introduction

In the next 15 years, California could face a substantial shortage of primary care clinicians. Some prior analyses conclude that the supply of primary care physicians in California is insufficient to meet the population's needs (Coffman, Geyn, Himmerick 2017; HRSA 2016). Not only is the number of primary care physicians inadequate, but there is also uneven distribution across regions of the state. The number of physicians completing primary care residencies in California does not appear adequate to replace primary care physicians who are anticipated to retire in the coming decade. Nurse practitioners (NPs) and physician assistants (PAs) play an important role in filling the gap caused by the shortage of physicians, and the numbers of these clinicians are growing more rapidly than the number of physicians. The question of whether the supply of primary care physicians, NPs, and PAs at statewide and regional levels will be adequate to meet the future health care needs of California's population must be assessed so that policymakers, health care clinicians, and educational institutions can identify strategies to fill potential shortfalls.

This report is the second in a series of three reports from Healthforce Center at the University of California, San Francisco on the supply and demand for primary care clinicians in California. The first report described the supply, distribution, and demographic characteristics of California's primary care clinicians (Coffman, Geyn, Himmerick 2017). This second report forecasts the future supply and demand for primary care clinicians. The third report will provide additional information about strategies for increasing primary care clinician supply that are being implemented in California and other states.

This report is divided into four chapters. The first chapter focuses on forecasting the supply of primary care clinicians in California, describing the methods used and the results for physicians, NPs, and PAs. Chapter 2 turns to the demand for primary care services and clinicians. The third chapter compares supply and demand forecasts statewide and for each region of California. Chapter 4 considers the policy implications of the results.

The forecasts of supply and demand for physicians are based solely on data about allopathic physicians (MDs). Forecasts were not generated for osteopathic physicians (DOs) due to the limited amount of data available about them. While the Medical Board has been surveying MDs for over 10 years, the Osteopathic Medical Board did not begin surveying DOs until July 2016. Only limited data are available from the American Osteopathic Association, the professional society of DOs. Forecasts presented in this report were developed for the state as a whole and for five regions: Greater Bay Area; Sacramento, Sierra, and Northern counties; Central Valley and Central Coast; Los Angeles, Orange, and Inland Empire; and Southern Border. These delineations are based on the regions used by the California Health Interview Survey (CHIS); some CHIS regions are merged because labor markets are generally larger than primary care service markets, and because some regions do not have sufficient data to examine them independently. Table 1 lists the counties included in each region.

Table 1: Region Definitions

| Region	Counties included
Greater Bay Area	Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma
Sacramento, Sierra, and Northern	Alpine, Amador, Butte, Calaveras, Colusa, Del Norte, El Dorado, Glenn, Humboldt, Inyo, Lake, Lassen, Mariposa, Mendocino, Modoc, Mono, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Tuolumne, Yolo, Yuba
Central Valley & Central Coast	Fresno, Kern, Kings, Madera, Merced, Monterey, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Stanislaus, Tulare, Ventura
Los Angeles, Orange, Inland Empire	Los Angeles, Orange, Riverside, San Bernardino
Southern Border	Imperial, San Diego

Chapter 1 – Forecasted Supply of Primary Care Clinicians

The primary care workforce constantly changes with the entrance of newly trained physicians, nurse practitioners (NPs), and physician assistants (PAs); migration of clinicians from other states and countries; retirements; temporary departures from employment; and fluctuations in the number of hours clinicians choose to work. For purposes of these reports, primary care clinicians are defined as encompassing allopathic physicians (MDs), osteopathic physicians (DOs), NPs, and PAs that provide primary care. DOs are excluded from the forecasting report because there is not sufficient data on these clinicians. The number of DOs in California is smaller than any of the three other professions for which forecasts were developed – 6,408 DOs compared to 19,646 NPs, 9,752 PAs, and 112,929 MDs in 2016 (Coffman, Geyn, Himmerick 2017).

Method of Forecasting Supply

The supply forecasting method used for this report is commonly called a "stock-and-flow" model. The number of physicians, NPs, and PAs both licensed and living in California is the "stock" of clinicians. These are clinicians who could potentially provide primary care services. Inflows of clinicians are added to the stock of clinicians, and the outflows are subtracted from the stock. Estimates of the labor supply of clinicians are computed from the stock of clinicians potentially available to work and how much they choose to work in primary care. This number is expressed as full-time equivalent (FTE) employment in order to account for differences in the work commitments of clinicians employed full-time and part-time. Figure 1 illustrates this model.

Figure 1: A model of the supply of Health Professionals.
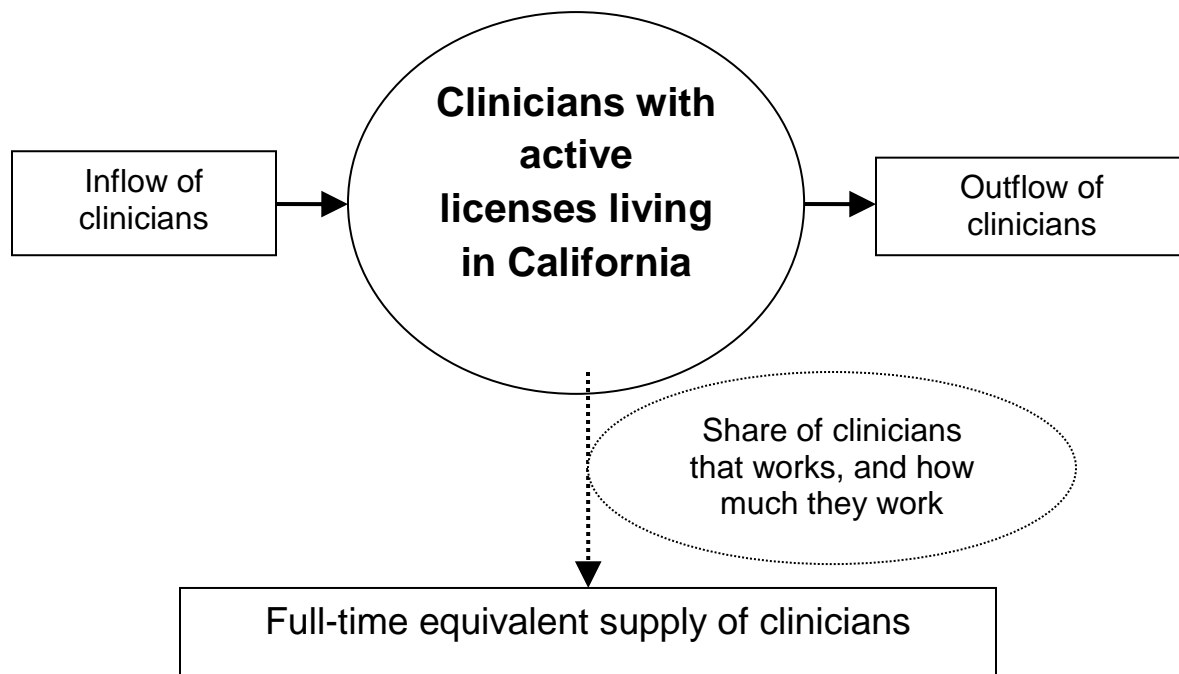
The inflow of clinicians includes graduates from education/residency programs in California and clinicians who relocate from other states or countries and obtain a license in California. The outflow is determined by migration out of California (to another state or country) and clinicians who allow their licenses to lapse so they permanently leave the profession. Lapsed licenses can occur due to retirement, desire to pursue another occupation, death, or myriad other reasons.

As inflows, outflows, and employment decisions change over time, so does the primary care clinician workforce. At first glance, it seems clear that the workforce will grow over time as long as the inflow of clinicians is greater than the outflow. However, such a comparison between total inflow and outflow does not take into account changes in the number of hours of patient care that clinicians provide as they age. For example, older clinicians may work fewer hours than younger clinicians or devote less time to patient care relative to other professional activities. The age distributions of the stock of clinicians and each inflow and outflow component affect supply. Thus, the model "ages" each age cohort to capture the impact of age on the supply forecast.

In the supply model, the number of clinicians with active licenses who reside in California is divided into age categories. A portion of each age group moves to the next (older) age group annually. We add the inflow estimates to and subtract the outflow estimates from each age group to obtain a forecast of the new stock of clinicians for the next year. Finally, we apply rates of employment and hours worked per week in primary care to the estimated stock of clinicians to obtain estimated FTE supply. This calculation is iterated through 2030 to obtain yearly forecasts of California's primary care clinician supply.

For some factors in the supply model, differing estimates are available, with no indication of which estimate is most reliable. For other factors, there is uncertainty as to whether current data are applicable to what might happen in the future. For example, it is not known how much physician, NP, PA, and education capacity will rise in the future. Thus, we produce multiple forecasts using a few plausible values to learn how changes in key variables might affect future supply.

Physician Supply Forecasts

Forecasts of physician supply were developed using three age categories: under 40 years, 40-60 years, and over 60 years. We assume that 10% of physicians in the youngest age group move to the middle age group each year, based on the assumption that nearly all physicians under 40 years are between 30 to 39 years, and thus one-tenth of them will "age" into the next category (40-60 years) each year. We assume that 5% of physicians in the middle age group move to the oldest age group each year; since the age group spans 22 years, nearly 5% would "age" into the next category each year. These calculations were based on the mathematical assumption that clinicians are evenly distributed within age groups.

Variables Used in Physician Supply Forecasts

Table 2 summarizes sources of data for the variables used to generate the physician supply forecasts. The stock of physicians in the starting year, 2015, is the number of licensed physicians in primary care specialties residing in California. These data were obtained from the Medical Board of California (MBC). Consistent with the first report in this series, primary care physicians are defined as family medicine physicians, general practitioners, general internists, general pediatricians, and obstetricians/gynecologists.

We measure the inflow of primary care physicians as the number of newly licensed physicians in primary care specialties. Data from the MBC were used to measure the number of new licenses issued in 2015 by region and by age group.

Outflows from California's primary care physician workforce are measured using MBC numbers of physician licenses in primary care specialties that lapsed in 2015. The rate of lapse for each age group and region is the ratio of the number lapsed to the total number licensed.

The employment decisions of licensed primary care physicians include whether to provide patient care and how many hours to work. We used data from the MBC to estimate the share of licensed physicians in primary care fields who provide at least ten hours of direct patient care per week, by age group and gender. We examined whether the results were sensitive to using different thresholds for employment, such as one hour per week or 20 hours per week of direct patient care and found that the forecasts did not change substantially.

**Table 2: Sources of data for physician supply forecasts.**

Component of model	Variable	Source
Stock	Number of primary care physicians residing in California	Medical Board of California
Inflows	New primary care physician licensees	Medical Board of California
Outflows	Lapsed licenses	Medical Board of California
Employment Decisions	Percent of licensed physicians in primary care fields providing patient care	Medical Board of California
	Average hours worked per week	Medical Board of California

Historical data from the MBC indicate that there has been variation over time in the number of new physician licenses issued each year (MBC, multiple years). Between fiscal years (FY) 2006-07 and 2008-09, there were declines in the numbers of new licenses issued annually. In contrast, there was 7% average annual growth between FY 2013-14 and 2015-16. Annual growth averaged 2.8% from FY 2004-05 to FY 2015-16. Thus, we developed three alternative forecasts, assuming 1%, 3%, and 7% annual growth rates in new licensees, to learn the impact of variation in new license numbers.

Statewide Physician Supply Forecasts

Forecasts of the future supply of primary care physicians in California are presented in Figure 2 for the three scenarios of 1%, 3%, and 7% annual growth in new licenses. In the 1% growth model, there would be 22,538 licensed physicians in primary care specialties in 2030, resulting in 18,178 FTEs providing primary care. In the 3% growth model 23,771 physicians in primary care specialties would produce 19,289 FTEs, and in the 7% growth model 27,039 physicians would provide 22,243 FTEs in primary care in 2030. All three models project a decline in primary care physician FTEs between 2016 and 2030; forecasted growth ranges from -24.6% (1% model) to -7.7% (7% model). This is largely due to the fact that 32% of California's physicians are over 60 years old, and the number of new licensees per year is not large enough to replace these physicians as they retire.
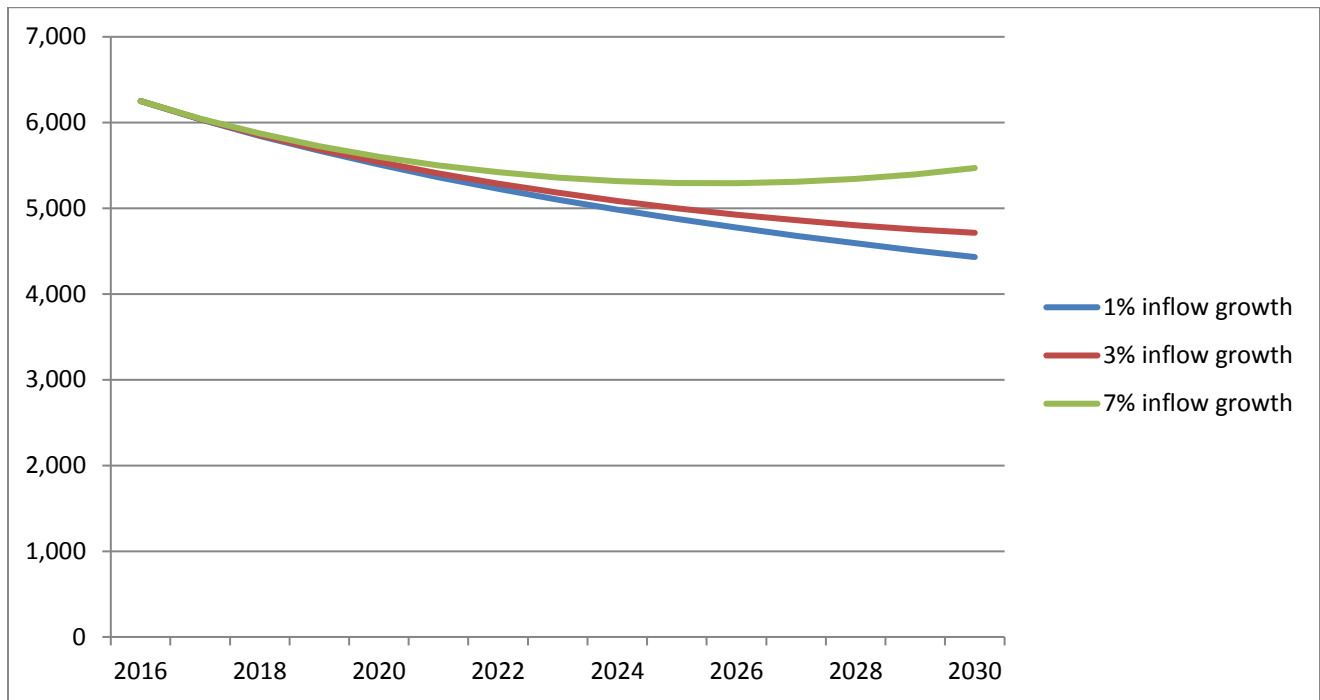
Figure 2: Forecasted Full-Time Equivalent Supply of Primary Care Physicians, California, 2016-2030
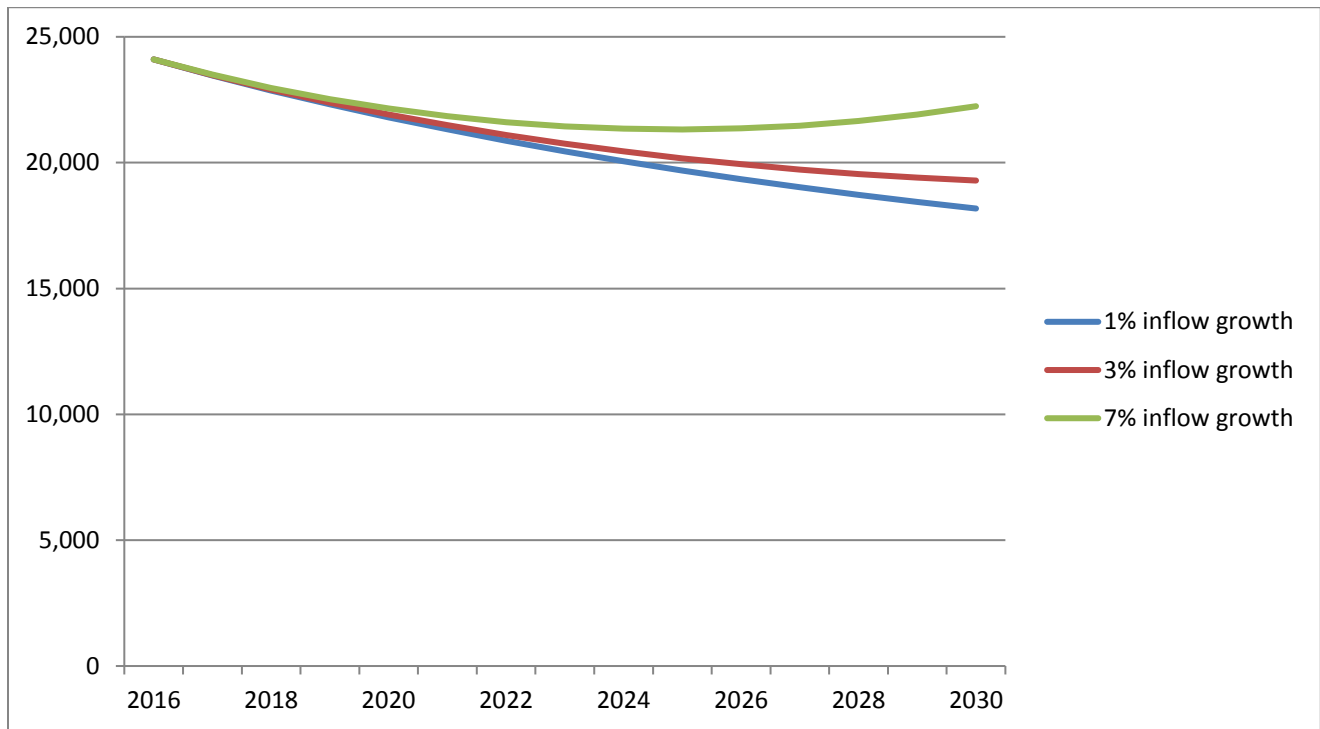
Greater Bay Area Physician Supply Forecasts

Forecasts of the future supply of primary care physicians in the Greater Bay Area are presented in Figure 3 for the three scenarios. In the 1% growth model, there would be 5,753 licensed physicians in primary care specialties in 2030, resulting in 4,431 FTEs providing primary care. In the 3% growth model, 6,073 physicians in primary care specialties would produce 4,714 FTEs, and in the 7% growth model, 6,926 physicians would provide 5,468 FTEs in primary care in 2030. The three models project a decline in primary care physician FTEs between 2016 and 2030 ranging from -29.1% (1% model) to -12.5% (7% model). These rates of decrease in primary care physician FTEs are greater than the decrease in primary care physician FTEs statewide.

Figure 3: Forecasted Full-Time Equivalent Supply of Primary Care Physicians, Greater Bay Area, 2016-2030

Sacramento, Sierra, and Northern Counties Physician Supply Forecasts

Figure 4 presents forecasts of the future supply of primary care physicians in the Sacramento, Sierra, and Northern Counties. In the 1% growth model, there would be 2,204 licensed physicians in primary care specialties in 2030, resulting in 1,750 FTEs providing primary care. In the 3% growth model, 2,316 physicians in primary care specialties would produce 1,852 FTEs, and in the 7% growth model, 2,612 physicians would provide 2,120 FTEs in primary care in 2030. All three models project a decline in primary care physician FTEs between 2016 and 2030 of -22.1% (1% model) to -5.6% (7% model), which is less than the decrease in primary care physician FTEs statewide.

Figure 4: Forecasted Full-Time Equivalent Supply of Primary Care Physicians, Sacramento, Sierra, and Northern Counties, 2016-2030
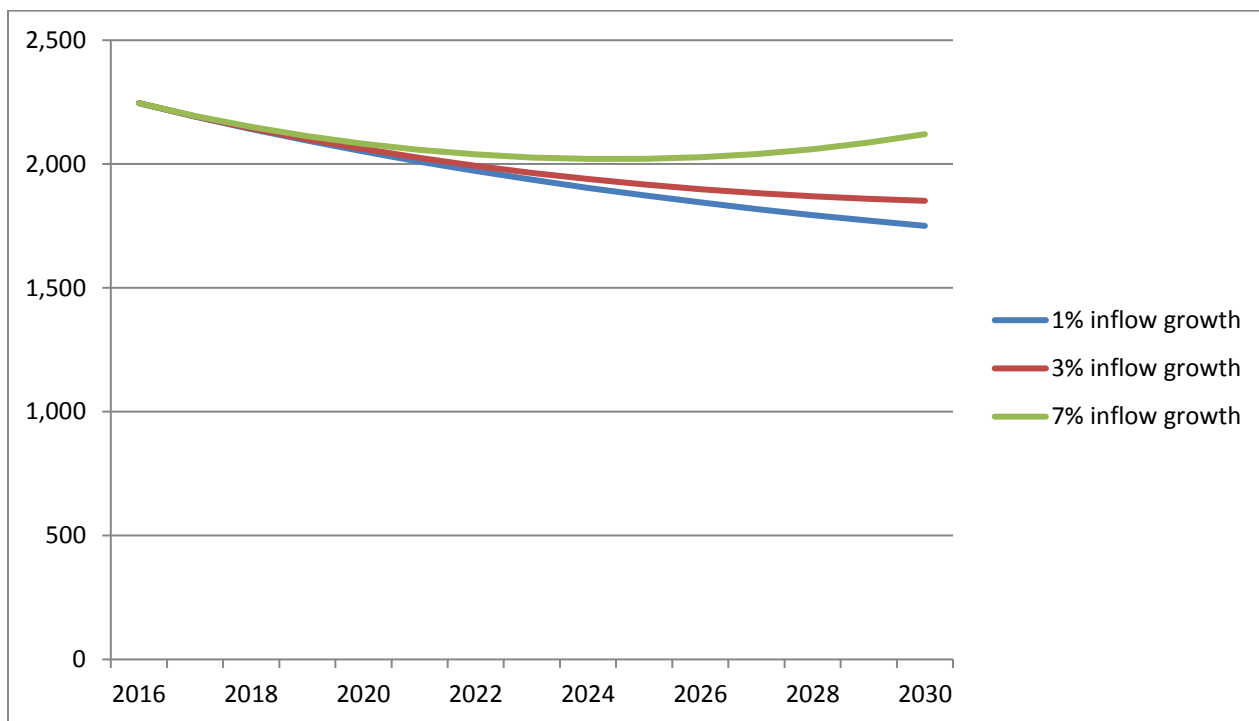
Central Valley and Central Coast Physician Supply Forecasts

Forecasts of the future supply of primary care physicians in the Central Valley and Central Coast are presented in Figure 5 for the three scenarios. In the 1% growth model, there would be 3,620 licensed physicians in primary care specialties in 2030, resulting in 3,094 FTEs providing primary care. In the 3% growth model 3,846 physicians in primary care specialties would produce 3,304 FTEs, and in the 7% growth model, 4,441 physicians would provide 3,857 FTEs in primary care in 2030. Primary care physician FTEs are projected to decrease by 7.8% and 1.6% respectively, in the models that project 1% and 3% growth in MD supply. The 7% model leads to projected 14.9% growth in primary care physician FTEs. This is because a greater share of new licensees in the Central Valley are under 40 years old compared with other regions of California. Growth in new licensees will produce a longer-lived increase in supply because these younger physicians are expected to have a longer working life in the region. The Central Valley and Central Coast is the only region that is forecast to have any increase in primary care physician FTEs under any scenario for growth in inflow of clinicians. This is largely the result of the region receiving proportionately more new licensees in 2015 than other regions. Of new licensees, 17.1% had addresses in this region, compared with this region having 13.4% of total licensed physicians. This disproportionately high rate of new licenses multiplies in the 7% model to produce growth in primary care physician supply.

Figure 5: Forecasted Full-Time Equivalent Supply of Primary Care Physicians, Sacramento, Sierra, and Northern Counties, 2016-2030.
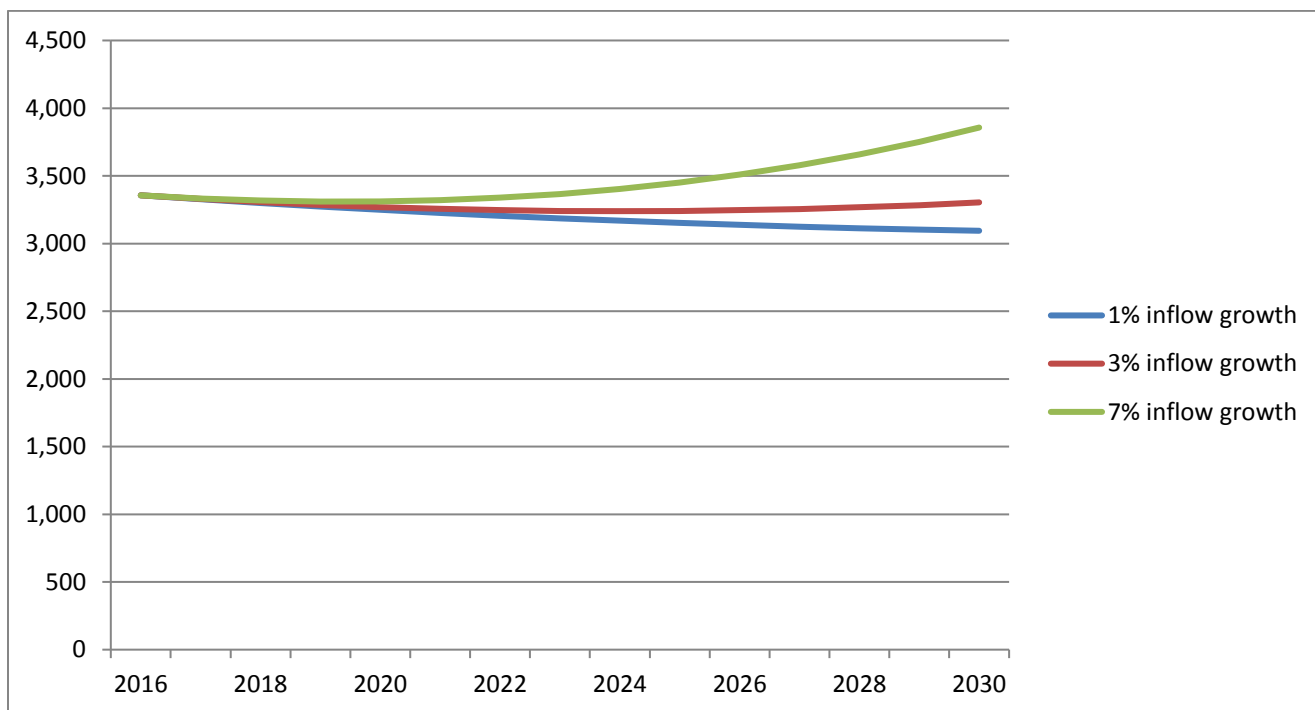
Los Angeles, Orange, and Inland Empire Physician Supply Forecasts

Figure 6 presents forecasts of the future supply of primary care physicians in the Los Angeles, Orange, and Inland Empire region. In the 1% growth model, there would be 9,287 licensed physicians in primary care specialties in 2030, resulting in 7,639 FTEs providing primary care. In the 3% growth model, 9,781 physicians in primary care specialties would produce 8,086 FTEs, and in the 7% growth model, 11,091 physicians would provide 9,272 FTEs in primary care in 2030. All three models project a decline in primary care physician FTEs, ranging from -24.5% (1% model) to -8.3% (7% model), which is similar to the rate of decrease in primary care physician FTEs statewide.

Figure 6: Forecasted Full-Time Equivalent Supply of Primary Care Physicians, Los Angeles, Orange, and Inland Empire, 2016-2030.
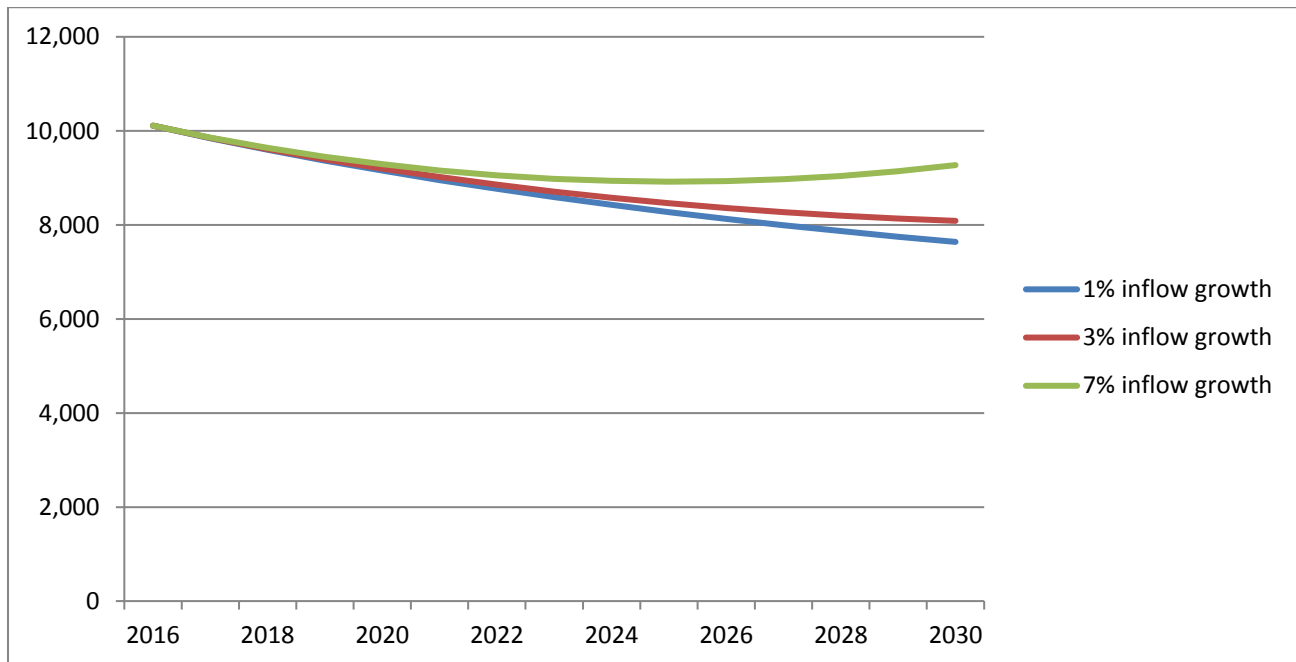
Southern Border Physician Supply Forecasts

Forecasts of the future supply of primary care physicians in the Southern Border region are presented in Figure 7 for the three scenarios. In the 1% growth model, there would be 1,851 licensed physicians in primary care specialties in 2030, resulting in 1,439 FTEs providing primary care. In the 3% growth model, 1,944 physicians in primary care specialties would produce 1,523 FTEs, and in the 7% growth model, 2,190 physicians would provide 1,748 FTEs in primary care in 2030. All three models project a decline in primary care physician FTEs between 2016 and 2030, ranging from -32.7% (1% model) to -18.3% (7% model). This region is forecast to have the greatest rate of decrease in primary care physician FTEs across the five regions. This is likely due to this region having higher rates of licenses lapsing than other regions for all age/gender groups with the exception of male physicians 60 years and older.

Figure 7. Forecasted Full-Time Equivalent Supply of Primary Care Physicians, Southern Border, 2016-2030
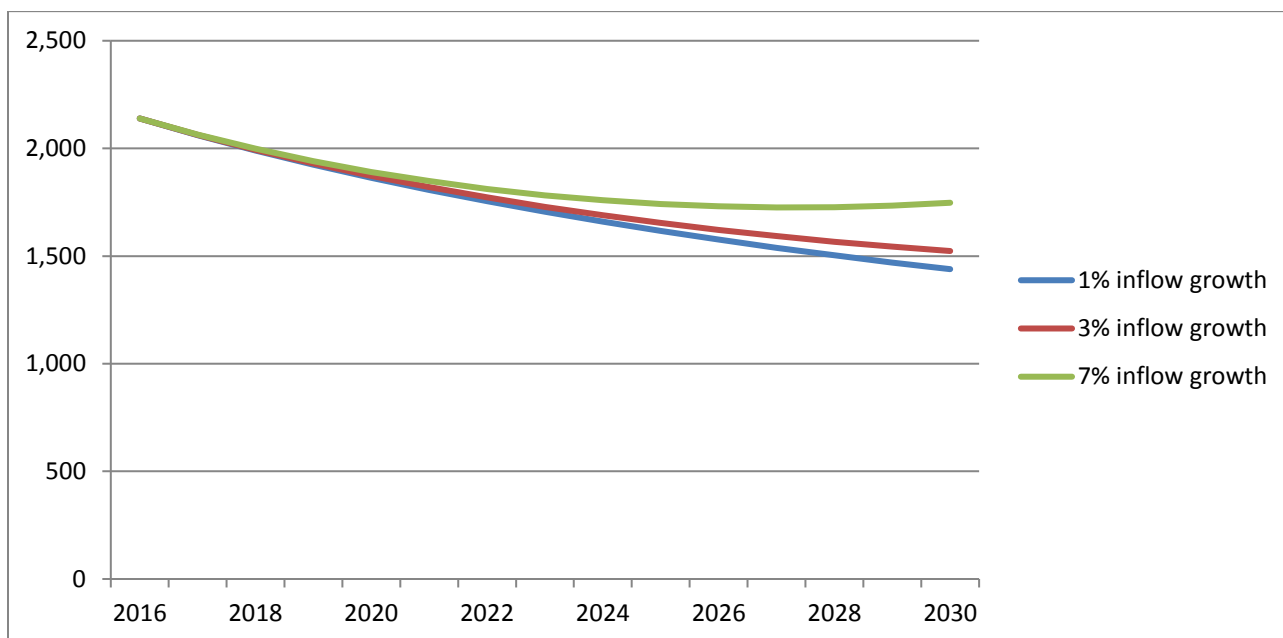
Nurse Practitioner Supply Forecasts

Forecasts of NP supply were developed using three age categories: under 40 years, 40-60 years, and over 60 years. We assume that 8% of NPs move from the youngest to the middle age category each year based on the assumption that NPs in this age bracket range from 27 to 40 years old, and thus about 8% will "age" to the next category every year. We assume that 5% of NPs move from the middle to the oldest age category each year as we do in our forecasts of the future supply of physicians.

Variables Used in Physician Supply Forecasts

Table 3 summarizes sources of data for the variables used to generate the NP supply forecasts.

The stock of NPs in the starting year, 2015, is the number of licensed nurse practitioners residing in California, by age group and region. These data were provided by the California Board of Registered Nursing (BRN).

There are two sources of inflows to the stock of NPs. The first is the number of people completing NP education programs in California. The BRN provided these data for 2015 by age group and county of residence. We assume that all NPs graduating from California-based programs begin work in the region in which they were educated. The other inflow is the movement of NPs from other states and countries to California. The data received by the BRN also included the number of new California NP licenses issued to those graduating from non-California education programs. In order to obtain a California NP license after completing NP education outside the state, an NP must have national certification from a recognized organization. Thus, in the BRN data files, these NPs are identified as having been licensed "by national certification."

Data on outflows from California's NP workforce were obtained from the BRN, measured as the number of NPs that allowed their license to lapse in 2016 by age group and region.

We used data from the 2010 California Survey of Nurse Practitioners and Certified Nurse-Midwives to estimate the share of NPs employed in an NP position as well as the average number of hours worked per week, by age group. The same data reveal that 51.9% of employed NPs work in primary care (Spetz, Fraher, Li, Bates, 2015). We calculated the number of full-time equivalent (FTE) NPs in each of the three age groups and multiplied by 51.9% to estimate the number of FTE NPs providing primary care.

Table 3. Sources of data for NP supply forecasts

Component of model	Variable	Source
Stock	Number of licensed NPs residing in California	California Board of Registered Nursing
Inflows	New licenses issued to California NP program graduates	California Board of Registered Nursing
	New licenses issued to NPs from other states/countries	California Board of Registered Nursing
Outflows	Lapsed licenses & relocation out of California	California Board of Registered Nursing
Employment Decisions	Percent of NPs working in NP jobs	2010 California Survey of Nurse Practitioners and Certified Nurse-Midwives
	Average hours worked per week	2010 California Survey of Nurse Practitioners and Certified Nurse-Midwives
	Percent of employed NPs in primary care jobs	2010 California Survey of Nurse Practitioners and Certified Nurse-Midwives

We developed three alternative forecasts of future NP supply statewide and for each region of California. The first assumes 1% growth per year in the number of California NP graduates and NPs relocating from other states/countries. This is based on the lack of growth in NP graduations in California between 2014 and 2015. The second and third forecasts assume 3% and 7% growth per year in the number of graduates and licensed issued to those from other states/countries and is based on higher rates in NP graduations in California and the United States in prior years (AACN, multiple years; Blash, Keane, Spetz 2016; HRSA 2016).

Statewide Nurse Practitioner Supply Forecasts

Forecasts of the future supply of NPs in California are presented in Figure 8 for the three scenarios of 1%, 3%, and 7% annual growth in new licenses. In the 1% growth model, there would be 38,019 licensed NPs in 2030, resulting in 12,097 FTEs providing primary care. In the 3% growth model, 42,087 NPs would produce 13,474 FTEs providing primary care, and in the 7% growth model, 52,765 NPs would provide 17,095 FTEs in primary care in 2030. Growth between 2016 and 2030 in FTEs providing primary care ranges from 82% (1% model) to 157% (7% model).

Figure 8. Forecasted Full-Time Equivalent Supply of Primary Care Nurse Practitioners, California, 2016-2030
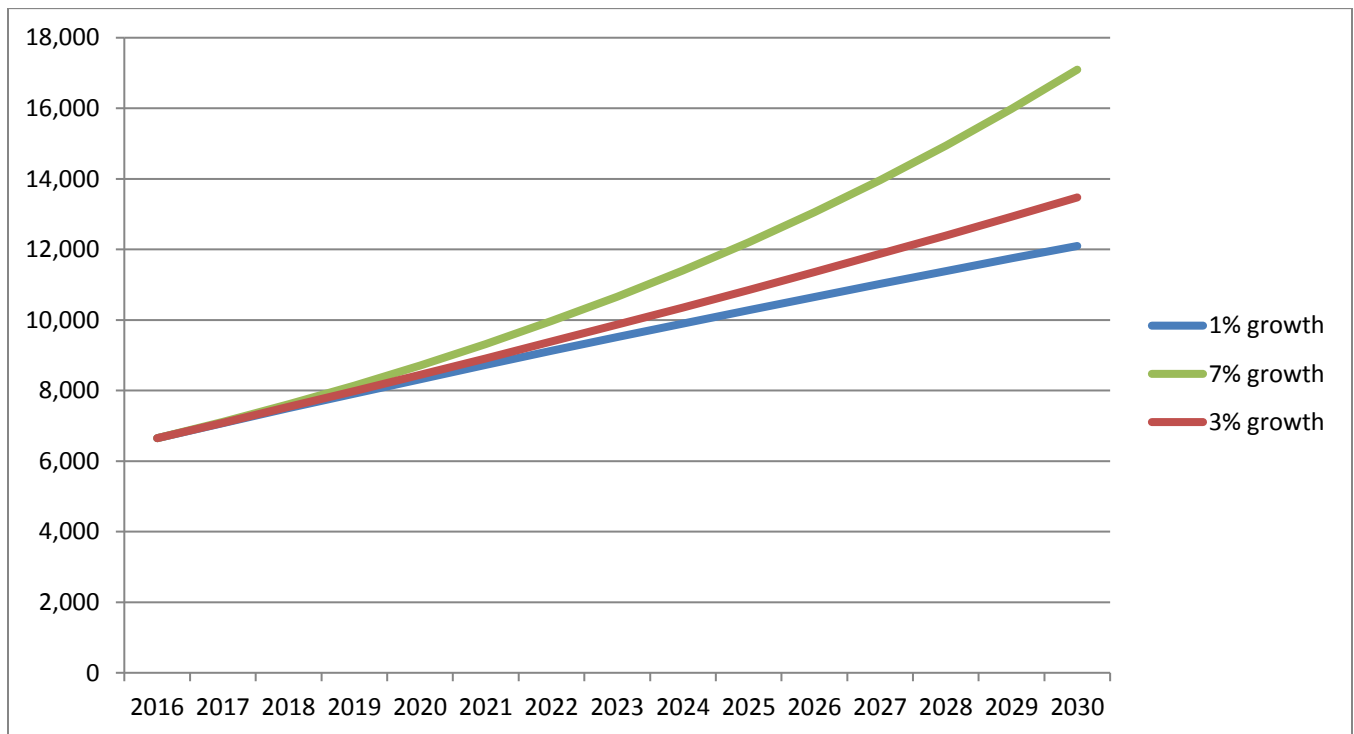
Greater Bay Area Nurse Practitioner Supply Forecasts

Figure 9 presents forecasts of the future supply of NPs in the Greater San Francisco Bay Area for the three growth scenarios. In the 1% growth model, there would be 9,669 licensed NPs in 2030 producing 3,073 FTEs providing primary care. In the 3% growth model, 10,681 NPs would produce 3,415 FTEs providing primary care, and in the 7% growth model, 13,339 NPs would provide 4,316 FTEs in primary care in 2030. Growth between 2016 and 2030 in FTEs providing primary care ranges from 74% (1% model) to 145% (7% model), which are notably lower than projected statewide growth rates.

Figure 9. Forecasted Full-Time Equivalent Supply of Primary Care Nurse Practitioners, Greater Bay Area, 2016-2030
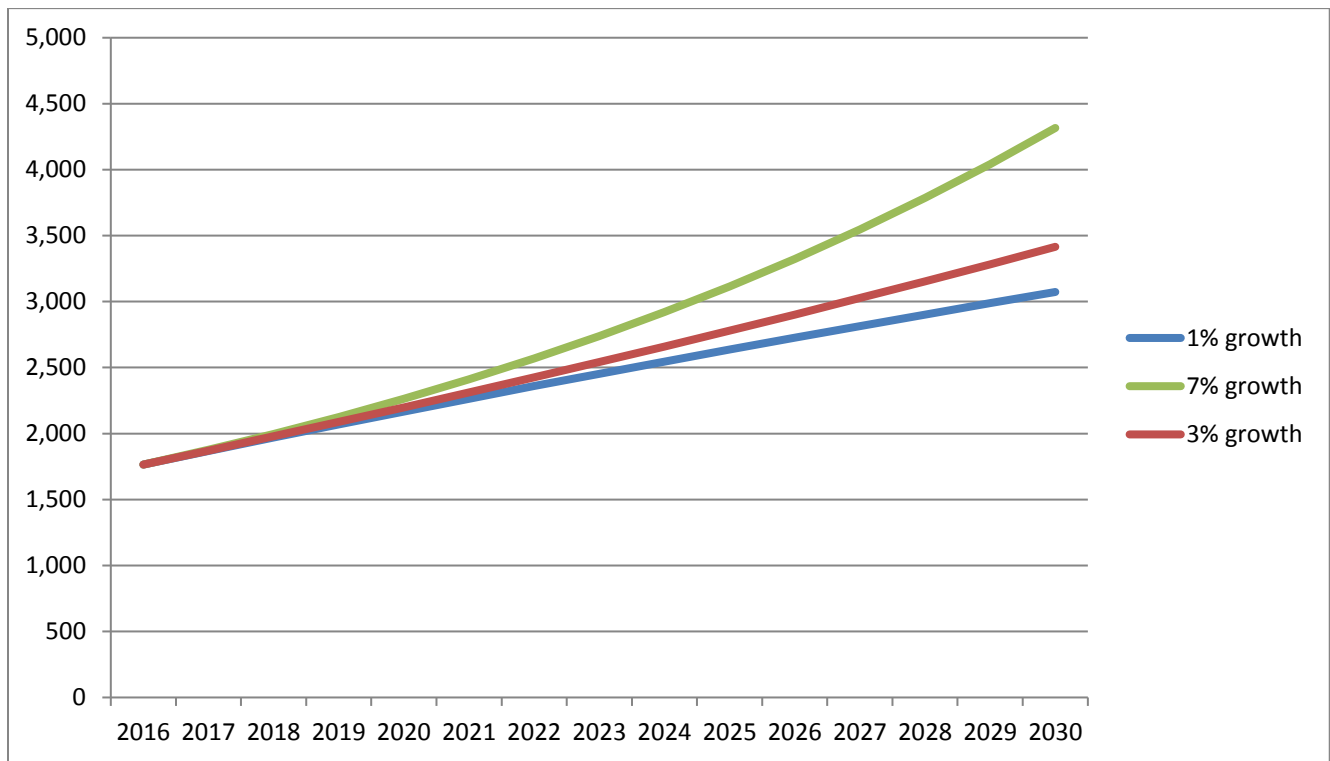
Sacramento, Sierra, and Northern Counties Nurse Practitioner Supply Forecasts

Forecasts of the future supply of NPs in Sacramento, Sierra, and Northern Counties are presented in Figure 10 for the three scenarios. In the 1% growth model, there would be 3,085 licensed NPs in 2030, resulting in 945 FTEs providing primary care. In the 3% growth model, 3,389 NPs would produce 1,044 FTEs providing primary care, and in the 7% growth model, 4,186 NPs would provide 1,304 FTEs in primary care in 2030. Growth between 2016 and 2030 in FTEs providing primary care ranges from 54% (1% model) to 113% (7% model), which are the lowest growth rates among all regions.

Figure 10. Forecasted Full-Time Equivalent Supply of Primary Care Nurse Practitioners, Sacramento, Sierra, and Northern Counties, 2016-2030
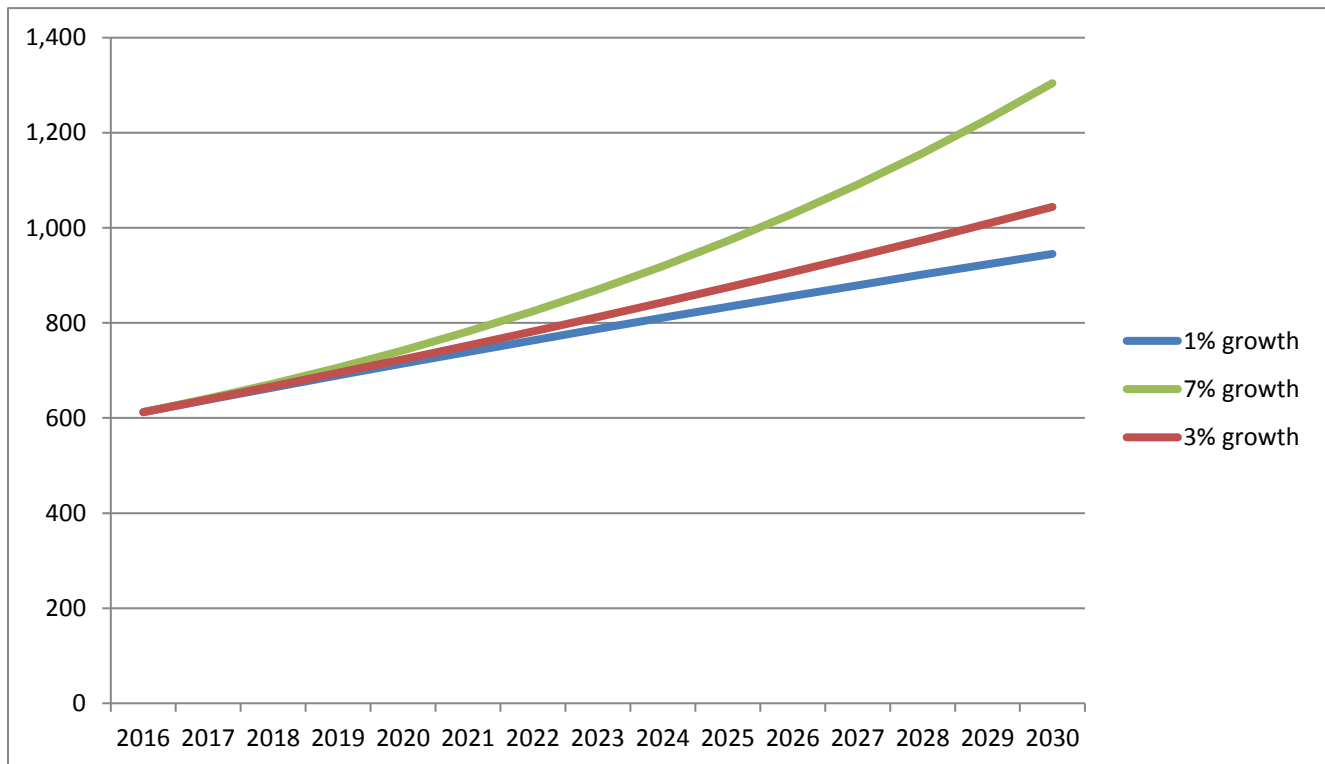
Central Valley and Central Coast Nurse Practitioner Supply Forecasts

Figure 11 presents forecasts of the future supply of NPs in the Central Valley and Central Coast regions for the three growth rates of new licenses. In the 1% growth model, there would be 4,598 licensed NPs in 2030, resulting in 1,414 FTEs providing primary care. In the 3% growth model, 5,038 NPs would produce 1,559 FTEs providing primary care, and in the 7% growth model, 6,192 NPs would provide 1,939 FTEs in primary care in 2030. Growth between 2016 and 2030 in FTEs providing primary care ranges from 66% (1% model) to 127% (7% model), which are the second-lowest growth rates among the regions.

Figure 11. Forecasted Full-Time Equivalent Supply of Primary Care Nurse Practitioners, Central Valley and Central Coast, 2016-2030
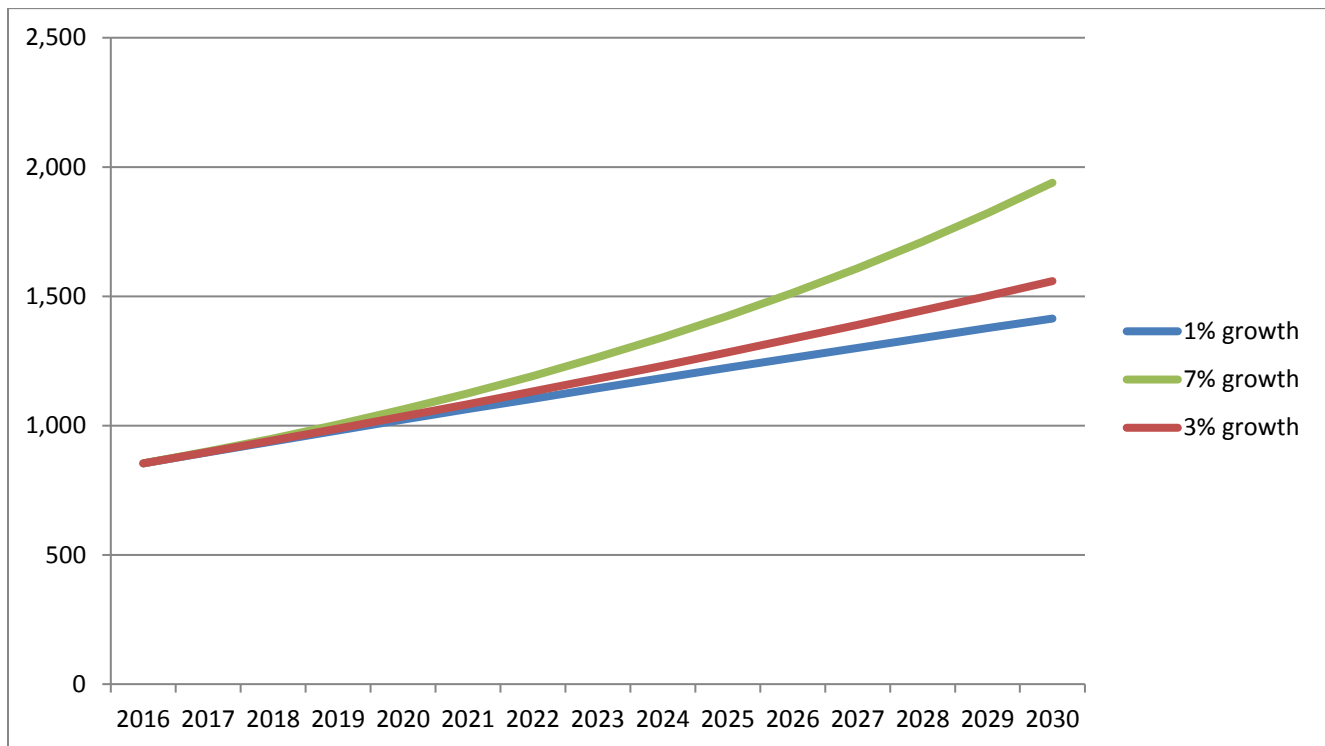
Los Angeles, Orange, and Inland Empire Nurse Practitioner Supply Forecasts

Forecasts of the future supply of NPs in Los Angeles, Orange, and Inland Empire counties are presented in Figure 12 for the three scenarios of 1%, 3%, and 7% annual growth in new licenses. In the 1% growth model, there would be 17,100 licensed NPs in 2030, resulting in 5,536 FTEs providing primary care. In the 3% growth model, 19,019 NPs would produce 6,195 FTEs providing primary care, and in the 7% growth model, 24,055 NPs would provide 7,926 FTEs in primary care in 2030. Growth between 2016 and 2030 in FTEs providing primary care ranges from 102% (1% model) to 190% (7% model), which are the highest growth rates among all regions of California.

Figure 12. Forecasted Full-Time Equivalent Supply of Primary Care Nurse Practitioners, Los Angeles, Orange, and Inland Empire, 2016-2030
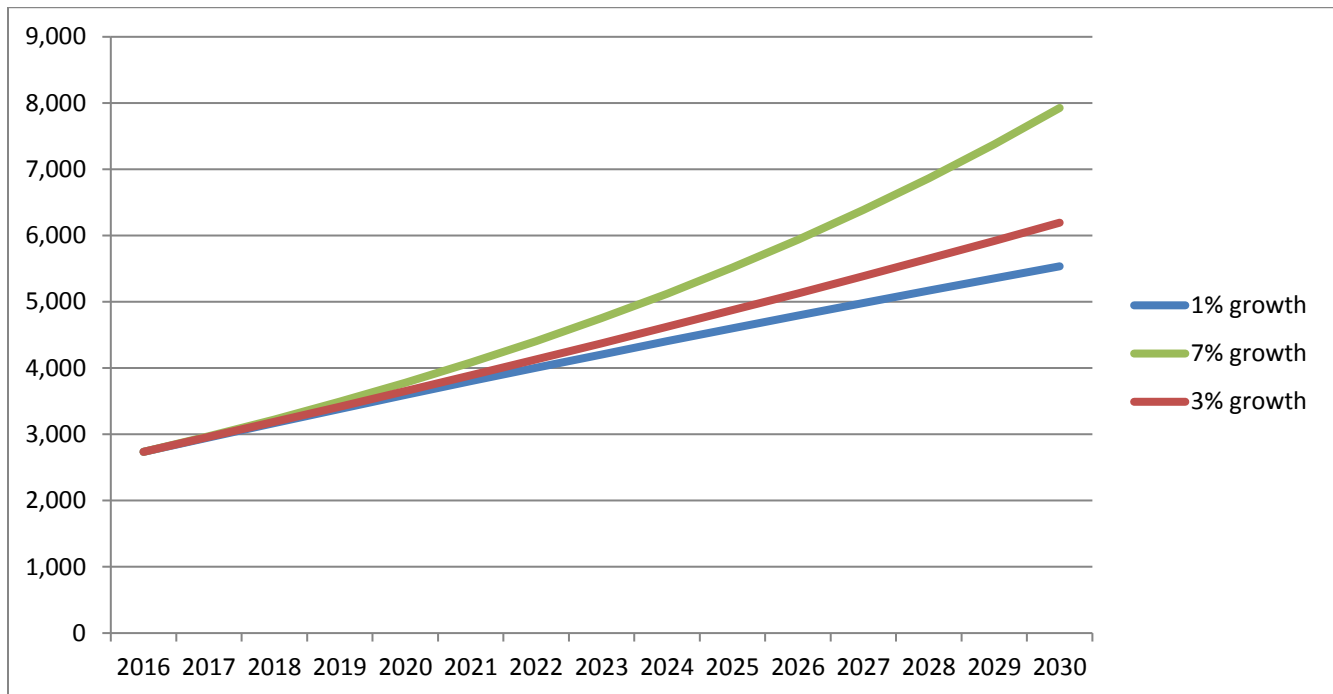
Southern Border Nurse Practitioner Supply Forecasts

Figure 13 presents forecasts of the future supply of NPs in the Southern Border region for the three scenarios. In the 1% growth model, there would be 3,624 licensed NPs in 2030, resulting in 1,149 FTEs providing primary care. In the 3% growth model, 4,020 NPs would produce 1,282 FTEs providing primary care, and in the 7% growth model, 5,060 NPs would provide 1,634 FTEs in primary care in 2030. Growth between 2016 and 2030 in FTEs providing primary care ranges from 68% (1% model) to 139% (7% model). This is the second highest rate of growth in NP FTEs across the five regions of California.

Figure 13. Forecasted Full-Time Equivalent Supply of Primary Care Nurse Practitioners, Southern Border, 2016-2030
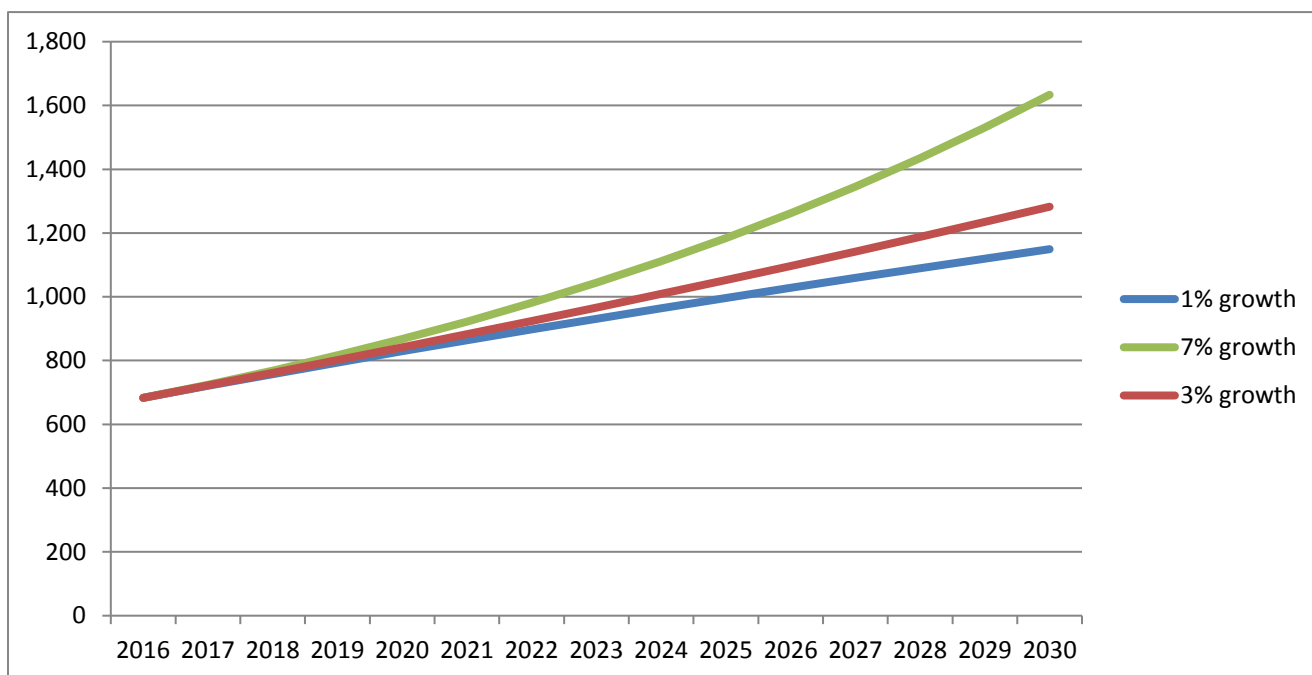
Physician Assistant Supply Forecasts

Forecasts of PA supply were developed using three age categories: under 40 years, 40-60 years, and over 60 years. We assume that 8% of PAs move from the youngest to the middle age category each year, based on the assumption that PAs in this age bracket range from 27 to 40 years old, and thus about 8% will "age" to the next category every year. We assume that 5% of PAs move from the middle to the oldest age category each year as we did for our forecasts of the supplies of primary care physicians and NPs.

Variables Used in Physician Assistant Supply Forecasts

Table 4 summarizes sources of data for the variables used to generate the PA supply forecasts.

According to the California Department of Consumer Affairs Licensee Masterfile (DCA), the stock of PAs in the starting year of 2016 is 9,718. This count is restricted to PAs with active licensees, but makes no exclusions based on patient care activity status. Of the 9,718 actively licensed PAs, 8,196 were certified by the National Commission on Certification of Physician Assistants (NCCPA).

There are two sources of inflows to the stock of PAs. The first is the number of people completing PA education programs in California. These data were obtained from the Physician Assistant Education Association (PAEA) by age group and region. As for the NP supply model, we assume that PAs will work in the region in which they completed their education. Note that there are no PA education programs in the Central Valley/Coast region or in the Southern Border region, which results in no inflow of new graduates in these regions. The other inflow is the movement of PAs from other states and countries to California. Data on this were not directly available. Thus, the estimate of PAs' migration to California is based on the rate of migration for NPs. The number of newly licensed NPs by national certification in 2015 was 79% of the number of licensed NPs who graduated from California programs. We assumed that this ratio applies to PAs; there were 396 graduates of California PA programs in 2015, so we assumed 313 PAs were licensed in California after moving from other states. We distributed these PAs across regions proportionately to the 2016 distribution of active PAs.

There are two sources of outflows for California's PA workforce: PAs allowing licenses to lapse and PAs moving out of California. Data were not directly available for these variables, so we used estimates obtained from the Board of Registered Nursing (BRN) for NPs.

The primary care labor supply of PAs also depends on the employment rate of PAs, the number of hours they work per week, and their rate of employment in primary care. Data from the American Community Survey (ACS) indicate that the employment rate of PAs is approximately 90%, but these data are imprecisely estimated. In addition, PAs who are working in other occupations are not identified as PAs in the ACS data, so the ACS data over-estimate the share of licensed PAs that is employed in a PA position. Thus, we based our estimates of PA employment on a combination of the ACS average and NP employment rates. We assumed that 90% of male PAs 60 years and younger and 85% of female PAs 60 years and younger are employed. We assumed that 49.8% of male PAs and 44.8% of female PAs over age 60 are employed in PA positions. The ACS data also indicate that PAs work about 40 hours per week on average. We assumed that all PAs 60 years and younger work this much, and that PAs over 60 years work 34.3 hours, which is an adjustment equivalent to the difference in average hours worked per week by NPs over and under 60 years.

Finally, data from NCCPA were used to estimate the percentage of PAs who are employed in primary care. The NCCPA data indicate that 26% of PAs certified by NCCPA (2,131 of 8,196) practice in primary care specialties. An additional 11% of PAs do not report their field of specialty.

Table 4. Sources of data for PA supply forecasts

Component of model	Variable	Source
Stock	Number of PAs residing in California	California Department of Consumer Affairs Licensee Masterfile
Inflows	Graduates of California PA education programs	Physician Assistant Education Association
	New licenses to PAs from other states/countries	Estimates based on California Board of Registered Nursing NP data
Outflows	Lapsed licenses & relocation out of California	Estimates based on California Board of Registered Nursing NP data
Employment Decisions	Percent of PAs working in PA jobs	American Community Survey/Census Bureau and 2010 California Survey of Nurse Practitioners and Certified Nurse-Midwives
	Average hours worked per week	American Community Survey/Census Bureau and 2010 California Survey of Nurse Practitioners and Certified Nurse-Midwives
	Percent of employed PAs in primary care jobs	National Commission on Certification of Physician Assistants

We developed four alternative forecasts of future PA supply statewide and for each region of California. The first assumes 1% growth per year in the number of California PA graduates and PAs relocating from other states/countries and that 26% of PAs work in primary care. The second also assumes 1% annual growth in new graduates and relocations, but that 37% of PAs work in primary care. These different rates of employment in primary care are based on the data from the NCCPA, in which 26% of respondents reported they were working in a primary care field while another 11% did not report any field of practice. Thus, 26% is the minimum rate employed in primary care and 37% is the maximum possible rate (i.e., assumes all PAs who did not report any field of practice provide primary care). The third and fourth forecasts assume 7% growth in PA graduations and relocations, with 26% and 37% of PAs employed in primary care, respectively. The two different PA growth rates are based on data from PAEA Annual Reports and Program Reports that show that annual rates of change in the numbers of PA graduates in California and the U.S. have ranged from -12.3% (California 2010-2011) and 15.97% (U.S. 2014-2015). The national annual average from 2002 to 2015 was been 5.6% growth, while the California annual average growth was less than 1%.

Statewide Physician Assistant Supply Forecasts

Forecasts of the future supply of PAs in California are presented in Figure 14 for the four scenarios associated with different rates of annual growth in new licenses and varying rates of primary care employment. In the model with the slowest new license growth and only 26% providing primary care, there would be 17,116 licensed PAs in 2030, resulting in 3,394 FTEs providing primary care. At the other end of the spectrum, with 7% growth in new licenses and 37% providing primary care, there would be 23,160 PAs providing 6,666 FTEs of primary care. Growth between 2016 and 2030 in FTEs providing primary care ranges from 64% to 127%.
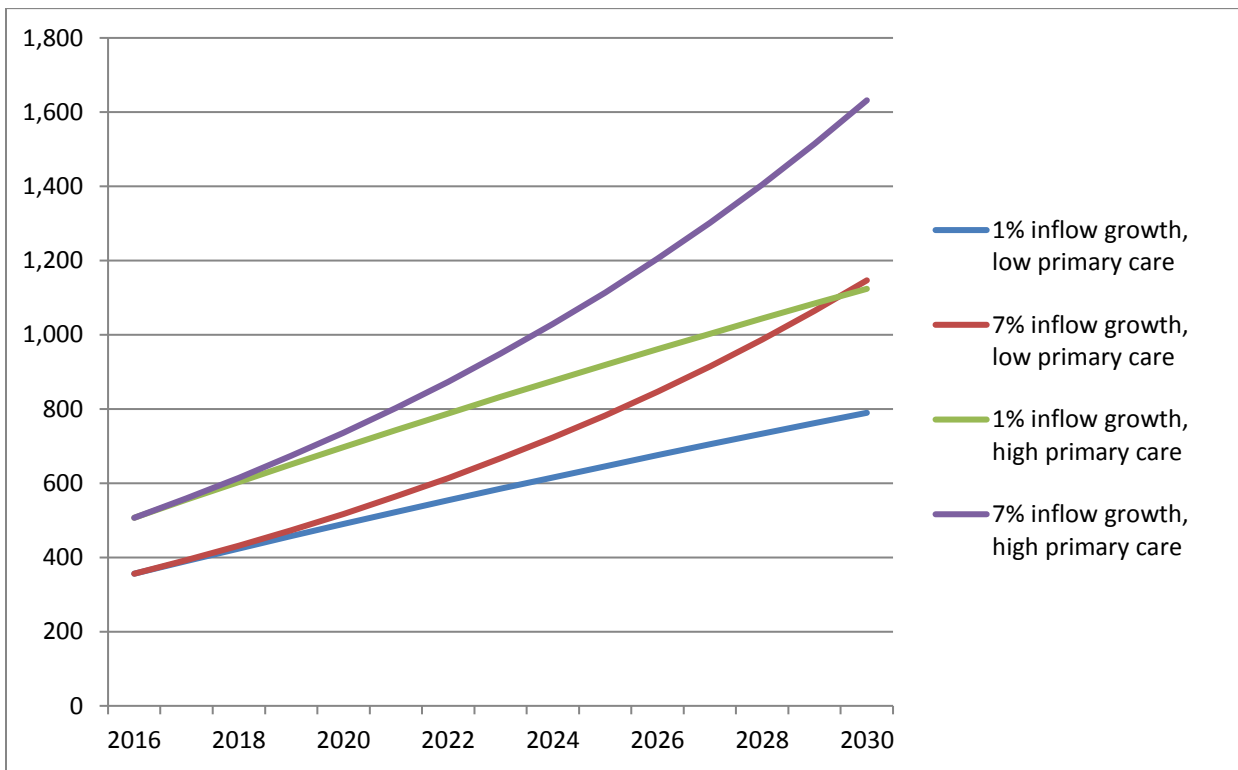
Figure 14. Forecasted Full-Time Equivalent Supply of Primary Care Physician Assistants, California, 2016-2030
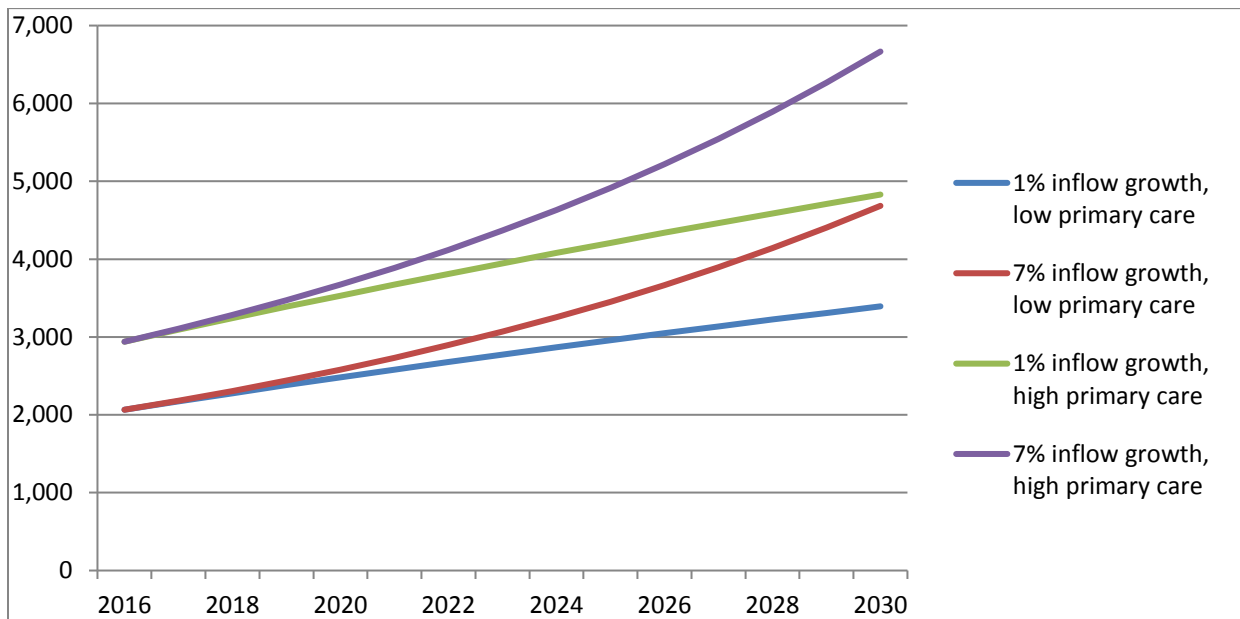
Greater Bay Area Physician Assistant Supply Forecasts

Forecasts of the supply of PAs in the Greater Bay Area are presented in Figure 15 for the four scenarios. In the model with the slowest new license growth and only 26% providing primary care, there would be 3,951 licensed PAs in 2030, resulting in 790 FTEs providing primary care. At the other end of the spectrum, with 7% growth in new licenses and 37% providing primary care, there would be 5,618 PAs providing 1,632 FTEs of primary care. Growth between 2016 and 2030 in FTEs providing primary care ranges from 122% to 222%, which are among the highest growth rates across California regions.

Figure 15. Forecasted Full-Time Equivalent Supply of Primary Care Physician Assistants, Greater Bay Area, 2016-2030

Sacramento, Sierra, and Northern Counties Physician Assistant Supply Forecasts

Figure 16 presents forecasts of the future supply of PAs in Sacramento, Sierra, and Northern Counties. In the model with the slowest new license growth and only 26% providing primary care, there would be 2,881 licensed PAs in 2030, resulting in 561 FTEs providing primary care. At the other end of the spectrum, with 7% growth in new licenses and 37% providing primary care, there would be 4,143 PAs providing 1,211 FTEs of primary care. Growth between 2016 and 2030 in FTEs providing primary care ranges from 145% to 259%, which are the highest rates in the state.

Figure 16. Forecasted Full-Time Equivalent Supply of Primary Care Physician Assistants, Sacramento, Sierra, and Northern Counties, 2016-2030
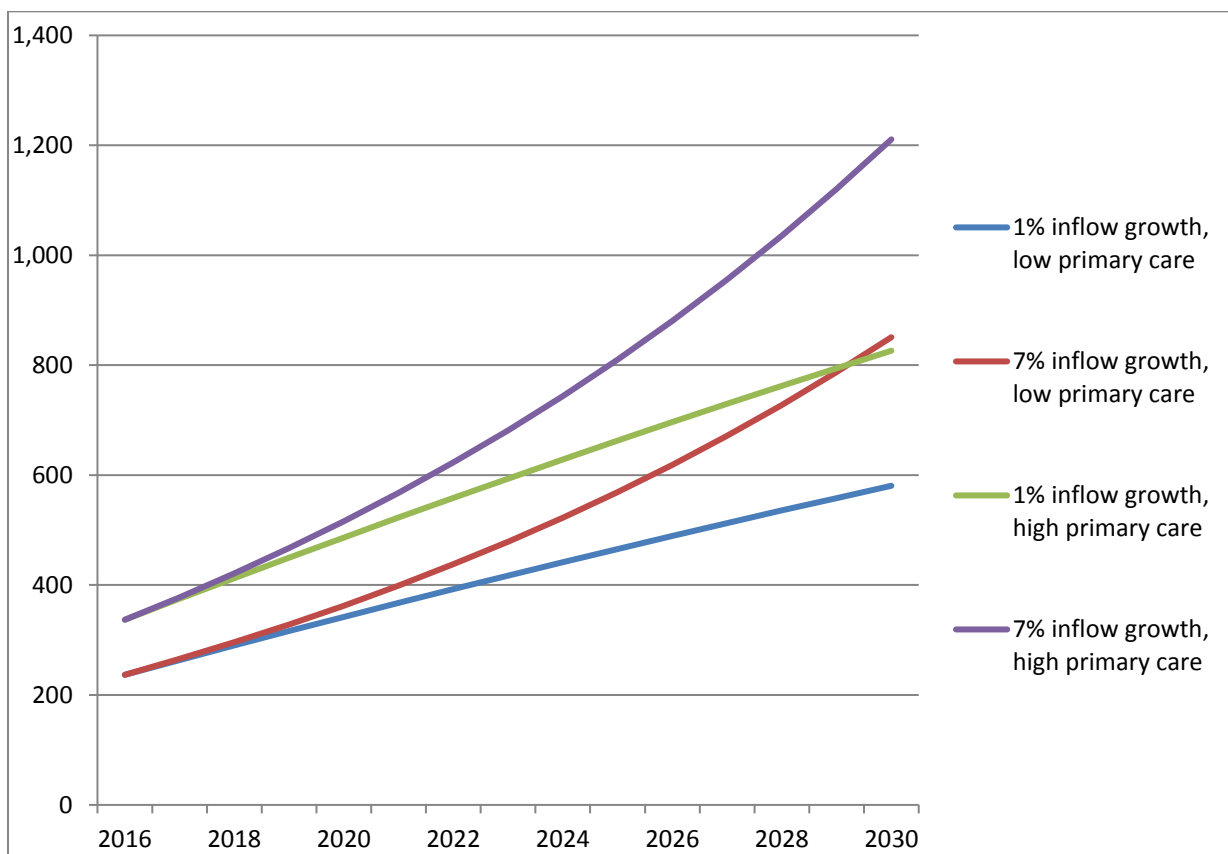
Central Valley and Central Coast Physician Assistant Supply Forecasts

Forecasts of the future supply of PAs in the Central Valley and Central Coast region are presented in Figure 17. In the model with the slowest new license growth and only 26% providing primary care, there would be 2,042 licensed PAs in 2030, resulting in 388 FTEs providing primary care. At the other end of the spectrum, with 7% growth in new licenses and 37% providing primary care, there would be 2,485 PAs providing 681 FTEs of primary care. Growth between 2016 and 2030 in FTEs providing primary care ranges from 15% to 42%. The growth rates in this region are low because there are no PA education programs and the models assume that PAs do not migrate between regions after graduation.

Figure 17. Forecasted Full-Time Equivalent Supply of Primary Care Physician Assistants, Central Valley and Central Coast, 2016-2030
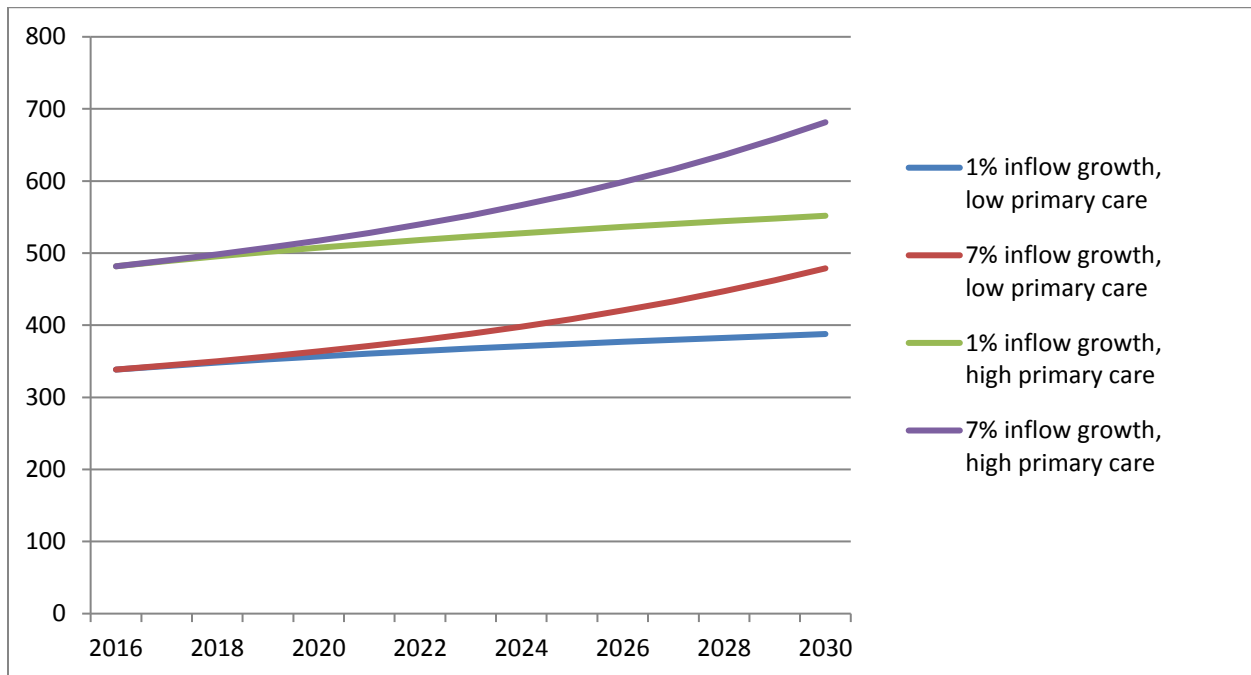
Los Angeles, Orange, and Inland Empire Physician Assistant Supply Forecasts

Figure 18 presents forecasts of the future supply of PAs in Los Angeles, Orange, and Inland Empire counties. In the model with the slowest new license growth and only 26% providing primary care, there would be 7,252 licensed PAs in 2030, resulting in 1,446 FTEs providing primary care. At the other end of the spectrum, with 7% growth in new licenses and 37% providing primary care, there would be 9,675 PAs providing 2,799 FTEs of primary care. Growth between 2016 and 2030 in FTEs providing primary care ranges from 56% to 113%.

Figure 18. Forecasted Full-Time Equivalent Supply of Primary Care Physician Assistants, Los Angeles, Orange, and Inland Empire, 2016-2030
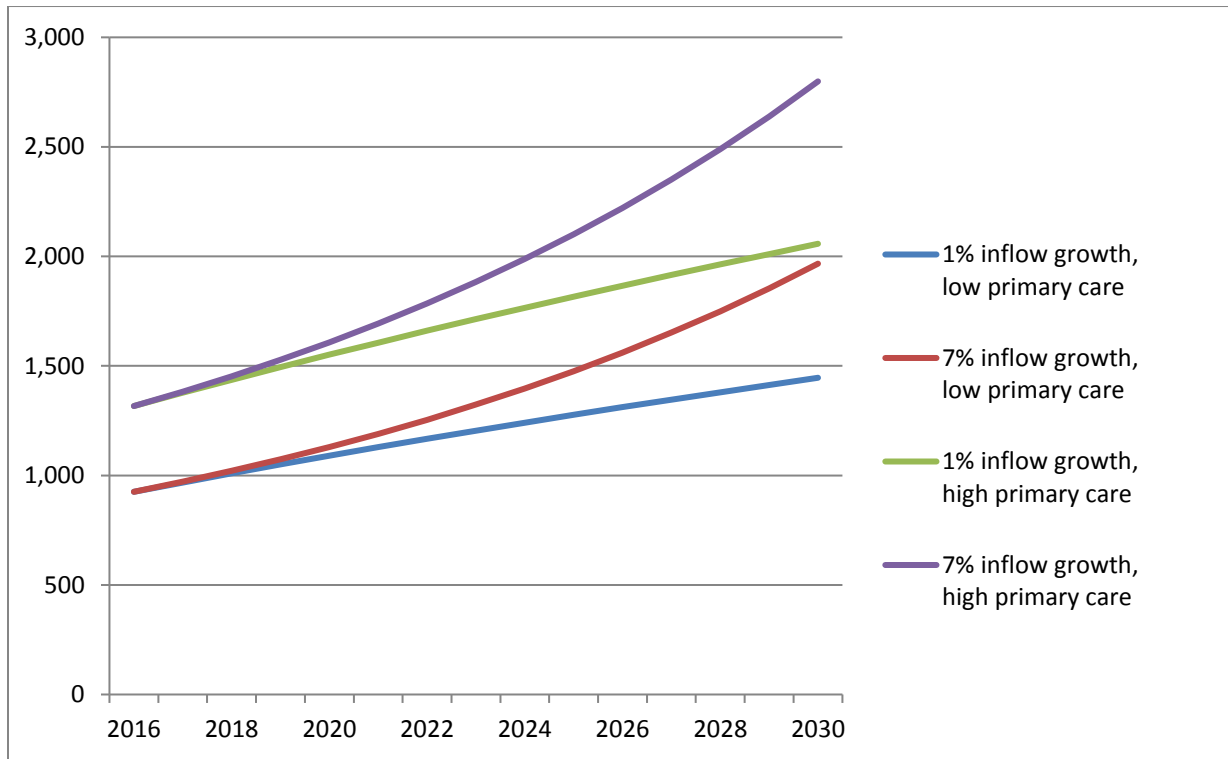
Southern Border Physician Assistant Supply Forecasts

Forecasts of the future supply of PAs in the Border region are presented in Figure 19. In the model with the slowest new license growth and only 26% providing primary care, there would be 1,085 licensed PAs in 2030, resulting in 210 FTEs providing primary care. At the other end of the spectrum, with 7% growth in new licenses and 37% providing primary care, there would be 1,342 PAs providing 375 FTEs of primary care. Growth between 2016 and 2030 in FTEs providing primary care ranges from 0.3% to 26%. These low growth rates can be attributed to the lack of PA education programs in the region; the models assume that PAs do not migrate between regions after graduation.

Figure 19. Forecasted Full-Time Equivalent Supply of Primary Care Physician Assistants, Southern Border, 2016-2030
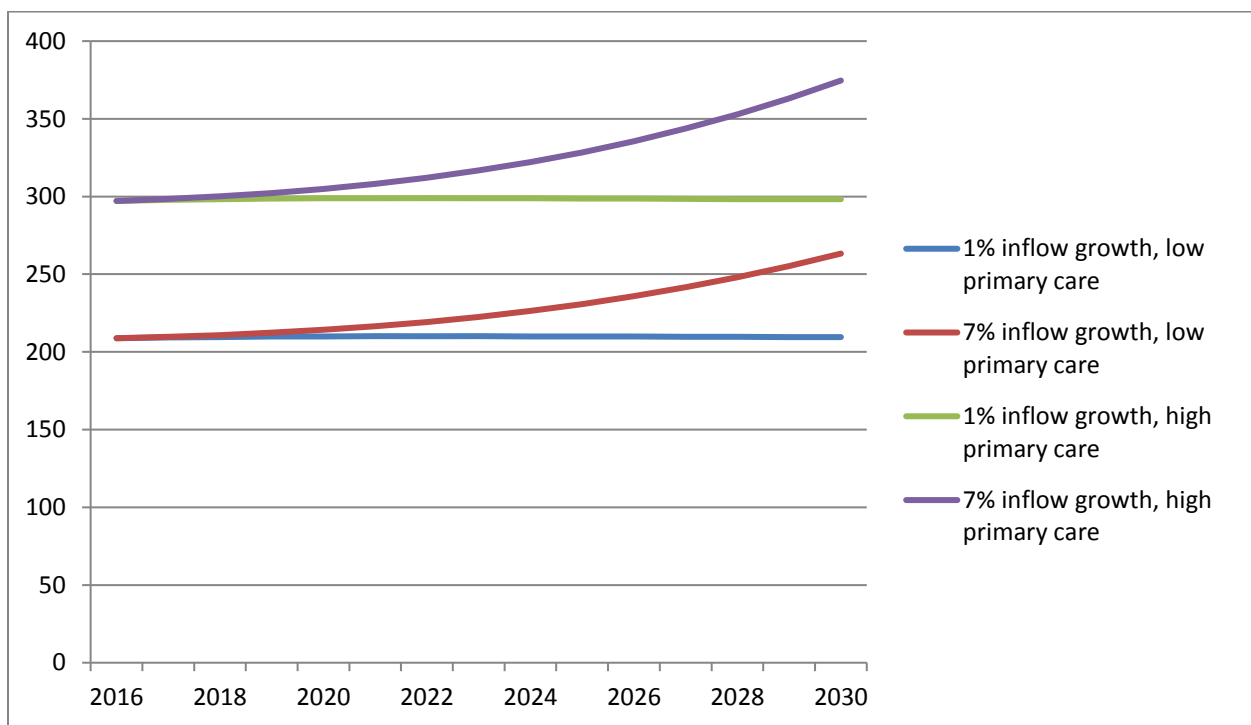
Chapter 2 – Forecasted Demand for Primary Care Clinicians

The demand for primary care clinicians can be measured and forecasted in many ways, reflecting disparate ideas about what demand is or should be. Many policymakers and health planners consider population needs as the primary factor that should dictate the need for health care workers and establish a targeted ratio of clinicians per 100,000 population. Alternately, policymakers sometimes seek to maintain a stable ratio of clinicians per 100,000 population based on the current number of clinicians, or estimate the number of clinicians needed to meet future demand for health care services.

For this report, four different measures of demand (or need) are considered in order to develop a range of plausible estimates of future demand for primary care clinicians. The basic approach to all demand forecasts is to identify a benchmark for either the number of primary care clinicians required or the amount of growth in primary care clinician supply needed to meet projected demand. We apply these benchmark data to future population projections reported by the California Department of Finance to forecast future primary care provider demand (California Department of Finance 2017). The four benchmarks are:

- Maintaining a stable ratio of employed primary care clinicians per 100,000 population, based on the average California ratio of primary care clinicians.

- Maintaining a stable ratio of employed primary care clinicians per 100,000 population, based on the average US ratio of primary care clinicians.

- Growing demand for physician visits as population grows based on current utilization of physician visits by age group, as reported in the California Health Interview Survey (CHIS). This benchmark is applied to both the number of clinicians and FTEs to yield two forecasts.

- Projected utilization of primary care clinician FTEs based on national utilization, as used by the Health Resources and Services Administration (HRSA) in their 2013 primary care forecasting report (HRSA 2013).

We compared the forecasts derived from these methods to the most recent forecasts published by HRSA (HRSA 2016). The HRSA forecasts produced statewide for the years 2015 and 2025 and are based on a complicated set of models that use multiple datasets to estimate future demand for health services and the subsequent demand for clinicians.

The demand forecasts are based on estimates of use of physician services in 2015 after implementation of the Affordable Care Act (ACA) substantially increased the number of Californians with health insurance. This expansion of access to health insurance led to an increase in demand for primary care and other health services. Utilization of physicians may differ in the future. Repeal or substantial retraction of the ACA could reduce insurance coverage and thus demand for health care services. In addition, a growing number of primary care providers are reimbursed through value-based payment models, including accountable care organizations and bundled payments. If value-based payment continues to penetrate the market, demand for primary care may increase more rapidly than we project.

Methods

All demand forecasts utilize population projections published by the California Department of Finance. County-level forecasts were grouped into the regions used in this report and extended to 2030. For all forecasts, we combined all three types of primary care clinicians to produce an overall benchmark of primary care clinicians required. We did not develop separate projections of demand for each type of clinician because there is variation within California and across the U.S. in the ratio of each type of provider to the others, and there is no consensus that any specific mix of types of clinicians is preferred. However, some specific populations, such as persons with complex conditions, may need more care from physicians. To the extent this occurs, the demand forecasts may overestimate the degree to which NPs and PAs can fill the gap between physician supply and demand for primary care services.

Demand based on California ratio of primary care clinicians per 100,000 population

The average number of employed primary care clinicians per 100,000 population in California was 124 in 2015 (Coffman, Geyn, and Himmerick, 2017, p. 55). This number includes 71 physicians, 27 nurse practitioners, and 26 physician assistants. We applied this ratio to projected population growth in order to forecast the number of employed primary care clinicians needed through 2030 to maintain the current ratio of primary care clinicians to population in California.

Demand based on national ratio of primary care clinicians per 100,000 population

The average number of employed primary care clinicians per 100,000 population in the US was 143 in 2015, which is notably higher than in California (Coffman, Geyn, and Himmerick, 2017, p. 55). This number includes 70 physicians, 42 nurse practitioners, and 31 physician assistants. We applied this ratio to projected population growth to forecast the number of employed primary care clinicians needed through 2030 to achieve and maintain the average US ratio of primary care clinicians to population. This benchmark produces higher demand estimates because the ratio of primary care clinicians to population in the US is higher than the ratio in California.

Demand based on California Health Interview Survey (CHIS) physician visit data

Data from the CHIS Child, Adolescent, and Adult Public Use Files were used to estimate the number of physician visits by age group in California in 2015. In the CHIS, the data are reported categorically if more than six visits were reported. For children, we assumed there was an average of eight visits for the category 6-12 visits, and 14 visits for the category 12 or more visits. For these ranges, we selected values at the lower ends of the ranges because the visit data are skewed toward fewer visits. Changes in the assumed number of visits for these ranges do not alter the forecasts substantively. For adults, we assumed there was an average of 7.5 visits for the category 7-8 visits, 10 visits for the category 9-12 visits, 14 visits for the category 13-24 visits, and 27 visits for the category 25 or more visits. Note that these data include both primary care and specialty physician visits. We multiplied the average number of visits by age group by projected population to obtain projected visits per age group. Since these data are for all physician visits rather than primary care visits only, they cannot be directly used to forecast the demand for primary care clinicians. We assumed that growth in primary care visits will be proportional to growth in overall visits. This forecasting method implicitly assumes that the number of primary care clinicians in California in 2015 was adequate and assumes there will not be substantial changes in demand for primary care visits as health insurance coverage or payment models change.

To translate the forecast of the number of primary care visits demanded to number of primary care clinicians demanded, we calculated projected growth rates as a percentage of the number of visits in 2016. For example, the number of physician visits statewide in 2015 was 133,812,805, and in 2020 the number of visits is projected to be 141,056,946; thus, the value in 2020 is 105% of the value in 2015. Therefore, California would need to have

105% of the number of physicians it had in 2015 to provide the same average number of visits per person by age group. The annual ratios were applied to the number of primary care clinicians licensed in 2016 and the number of estimated primary care FTEs in 2016 to obtain projections of the numbers of clinicians and FTEs required in the future.

Demand based on national primary care utilization

The primary care demand forecasts published by HRSA in 2013 included data on estimated use of primary care clinicians by age group, presented as full-time equivalent (FTE) demand, as derived from multiple national data sources (HRSA 2013). The HRSA data included separate figures for physicians, NPs, and PAs; we combined the three clinicians for this projection to focus on overall demand for primary care clinicians. We applied these estimates to California's population through 2030 to project demand for FTE primary care clinicians.

Statewide Demand Forecasts

Forecasts of the future demand for primary care clinicians in California are presented in Figure 20. The red lines indicate forecasts of FTEs, the green lines indicate forecasts of employed clinicians, and the blue line indicates the forecast of number of licensed clinicians. The two red dots are HRSA's estimates of demand in 2015 and 2025.

The forecasts of demand appear to vary widely, but the variation is primarily due to differences in estimated baseline demand. For example, the forecasts of the number of employed clinicians required are greater when using national benchmarks (solid green line) as compared with California benchmarks (dashed green line). The California-based line implicitly assumes that the number in 2016 was adequate, while the national-based line assumes that California should strive to have a greater supply of primary care clinicians to align with national utilization patterns. The two FTE forecasts are also similar to each other because they are both based on health care utilization data; the solid red line forecast is based on national utilization and the dashed red line is based on utilization as estimated in the CHIS. Note that HRSA projects greater FTE demand for primary care clinicians in 2025 than either of our FTE estimates.

The statewide forecasts of demand for predict that 68,729 licensed primary care clinicians will be required by 2030. The two forecasts of demand for FTE primary care clinicians predict that California will demand 39,331 or 44,188 primary care clinicians depending on whether the estimate is based on utilization of primary care clinicians in California or the United States. Projected growth in demand from 2016 to 2030 ranges from 11.9% to 16.9%.

Figure 20. Forecasted Demand for Primary Care Clinicians, Statewide, 2016-2030
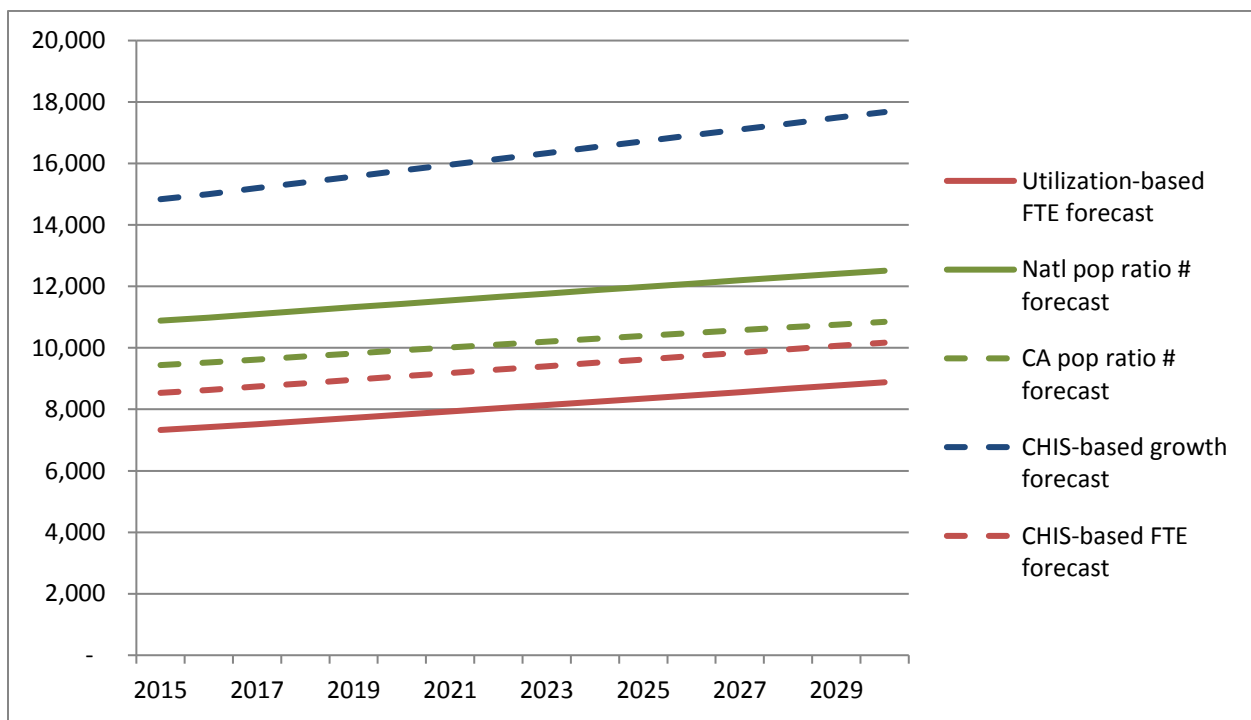
Regional Demand Forecasts

Greater Bay Area Demand Forecasts

Forecasts of the future demand for primary care clinicians in the Greater Bay Area are presented in Figure 21. Note that HRSA did not publish county-level forecasts for states, and, thus, no comparison with HRSA's projection is provided at the regional level. The Greater Bay Area forecasts predict that 17,674 licensed primary care clinicians will be required by 2030. The two forecasts of the demand for FTEs are 8,880 and 10,169. Projected growth in demand between 2016 and 2030 ranges from 13.9% to 19.7%. These projected rates of growth in demand are greater than the rates of growth projected for California overall.

Figure 21. Forecasted Demand for Primary Care Clinicians, Greater Bay Area, 2016-2030

Sacramento, Sierra, and Northern Counties Demand Forecasts

Figure 22 presents forecasts of the future demand for primary care clinicians in the Sacramento, Sierra, and Northern Counties. The forecasts predict that 6,764 licensed primary care clinicians will be required by 2030. The two demand forecasts of the number of FTEs are 3,751 and 4,269. Projected growth in demand between 2016 and 2030 ranges from 13.4% to 18.2%. These projected rates of growth in demand are greater than the rates of growth projected for California overall.

Figure 22. Forecasted Demand for Primary Care Clinicians, Sacramento, Sierra, and Northern Counties, 2016-2030

Central Valley and Central Coast Demand Forecasts

Forecasts of the future demand for primary care clinicians in the Central Valley and Central Coast are presented in Figure 23. The forecasts predict that 9,699 licensed primary care clinicians will be required by 2030. The two demand forecasts of the number of FTEs are 5,589 and 7,482. Projected growth in demand between 2016 and 2030 ranges from 15.0% to 19.0%. These projected rates of growth in demand are greater than the rates of growth projected for California overall.
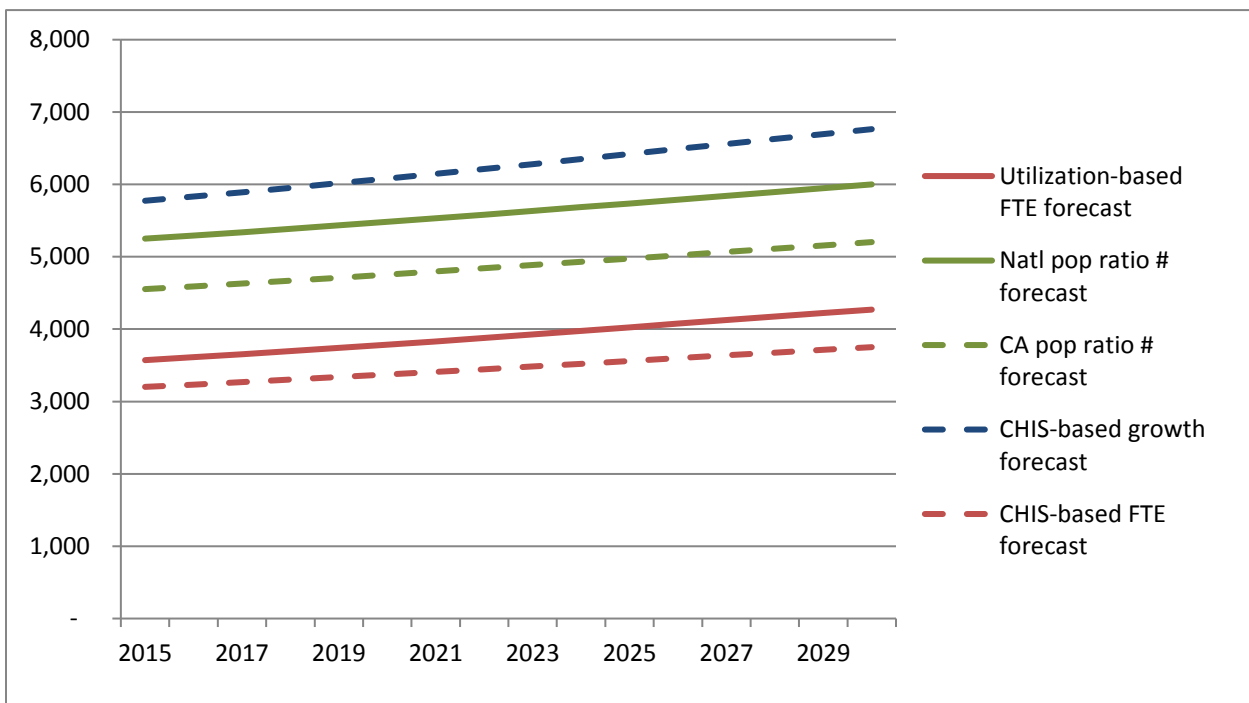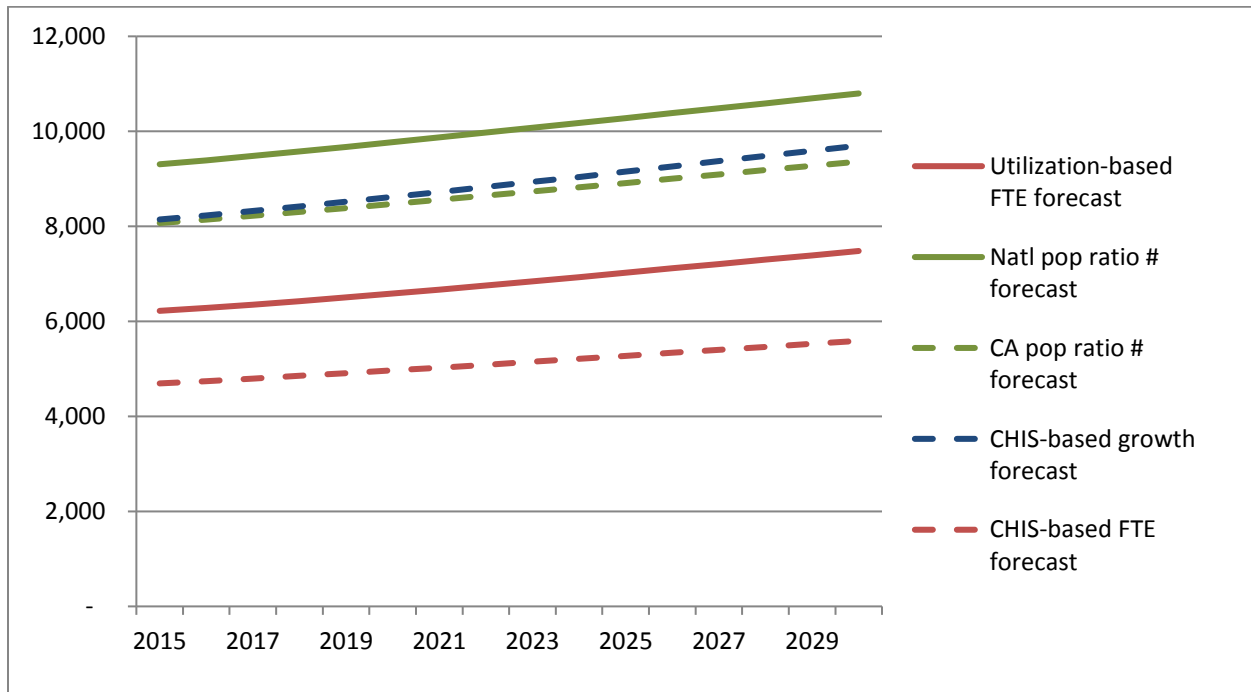
Figure 23. Forecasted Demand for Primary Care Clinicians, Central Valley and Central Coast, 2016-2030

Los Angeles, Orange, and Inland Empire Demand Forecasts

Figure 24 presents forecasts of the future demand for primary care clinicians in the Los Angeles, Orange, and Inland Empire region. The forecasts predict that 28,189 licensed clinicians will be required by 2030. The two demand forecasts of the number of FTEs are 16,276 and 19,694. Projected growth in demand between 2016 and 2030 ranges from 9.7% to 15.1%, which are lower than the rates of growth in demand projected for California overall.

Figure 24. Forecasted Demand for Primary Care Clinicians, Los Angeles, Orange, and Inland Empire, 2016-2030
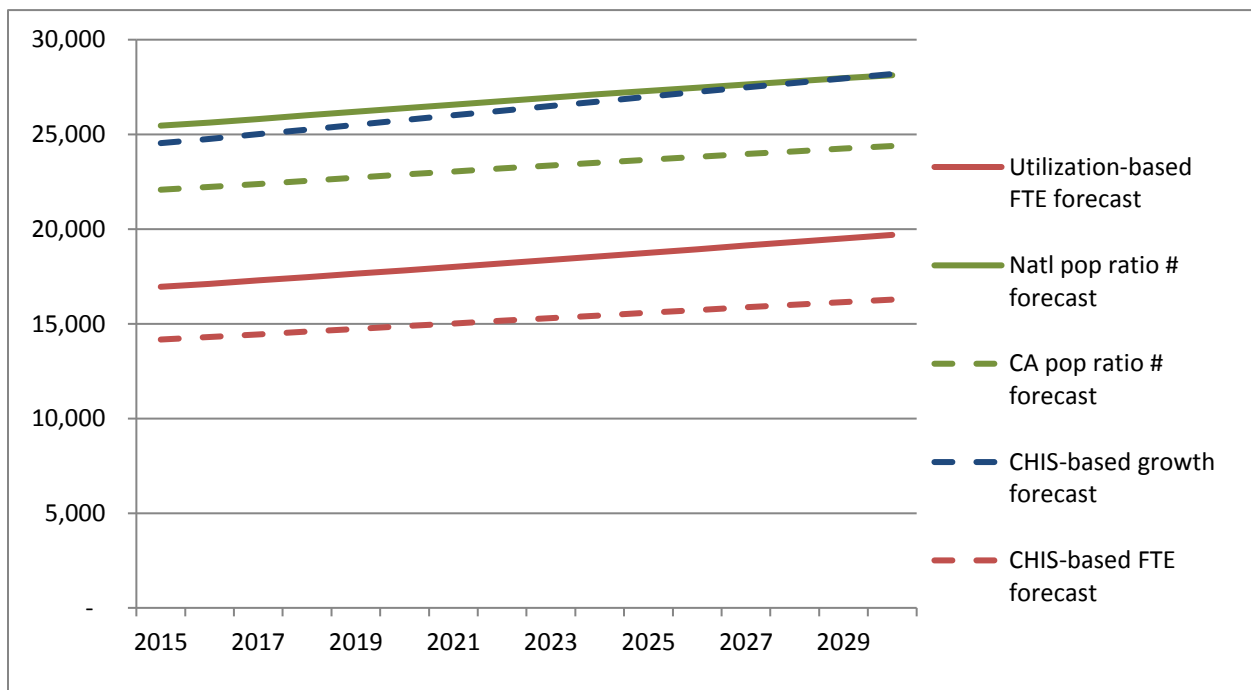
Southern Border Demand Forecasts

Forecasts of the future demand for primary care clinicians in the Southern Border region are presented in Figure 25. The forecasts predict that 6,480 licensed providers will be required by 2030. The two demand forecasts of the number of FTEs are 3,591 and 3,863. Projected growth in demand between 2016 and 2030 ranges from 10.6% to 14.7%. These rates are lower than the rates of growth in demand projected for California overall.
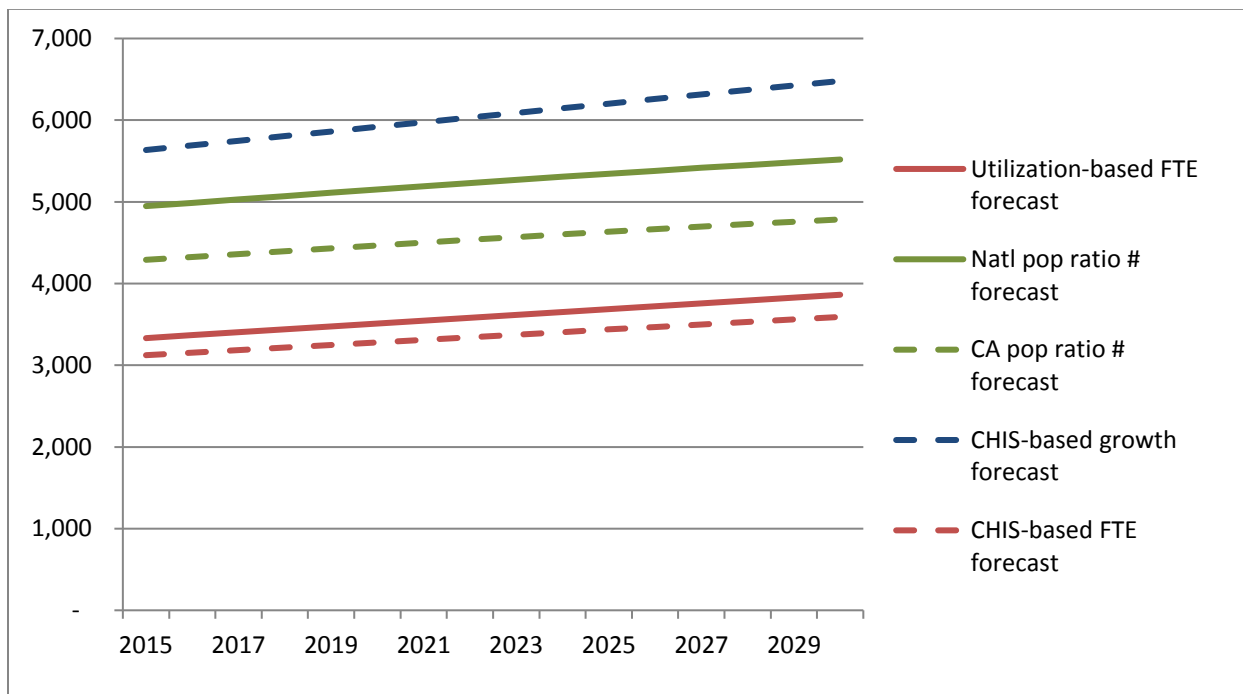
Figure 25. Forecasted Demand for Primary Care Clinicians, Southern Border, 2016-2030

Chapter 3 – Comparing Forecasted Supply and Demand for Primary Care Clinicians

This chapter compares the forecasts of FTE supply and demand to assess whether California and regions within California may face shortages of primary care clinicians in the future. For these comparisons, we averaged two forecasts of demand for FTEs – one based on utilization data reported by HRSA (2013) and one based on physician visit data from the CHIS. Multiple supply forecasts were developed for each of the three primary care professions, and the approach for selecting supply forecasts differed by profession. For the physician and NP supply forecasts, we compare forecasts that assume there will be 3% annual growth in new licensees and 7% annual growth. For the PA forecasts, we average the four FTE supply forecasts generated by different assumptions about annual growth in the inflow of PAs (1% vs. 7%) and the share of PAs employed in primary care (26% vs. 37%).

Statewide

Forecasts of statewide primary care clinicians' supply and demand are presented in Figure 26. The first two columns compare forecasts of FTEs in 2025 and the last two columns compare forecasts in 2030. Demand forecasts are in blue and indicate total demand for primary care clinicians. As noted above, we did not develop separate projections of demand for each type of clinician. There is no consensus regarding the ideal mix of types of clinicians, and observed ratios of clinicians vary region-to-region and state-to-state. The supply forecasts are in red and indicate forecasted supply of physicians, NPs, and PAs separately.

The forecasts indicate that California faces a potential shortfall of primary care clinicians if growth in supply of physicians, NPs, and PAs is in the mid-range of the forecasts developed. These forecasts project that California would have a shortage of full-time equivalent (FTE) 4,736 primary care clinicians in 2025 and a shortage of 4,103 FTE primary care clinicians in 2030. If the highest supply forecasts are considered, there will be a small shortage of clinicians in 2025 and a small surplus in 2030.

Figure 26. Forecasted Supply and Demand for Primary Care Clinicians FTEs, Statewide, 2025 and 2030
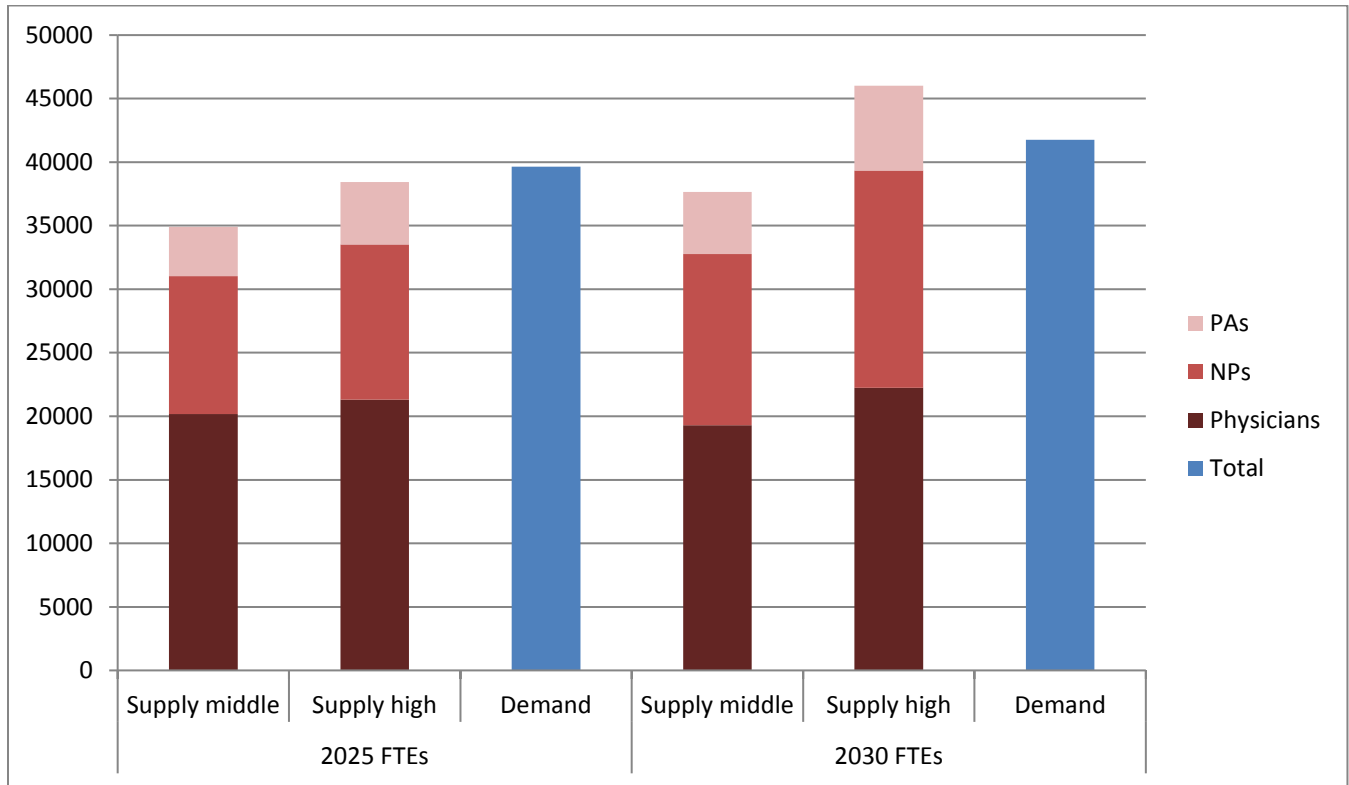
Note: The demand forecast is the average of the FTE forecast based on utilization data reported by HRSA (2013) and the FTE forecast based on physician visit data from the CHIS. "Supply middle" and "Supply high" correspond to assumptions of 3% and 7% rates of growth in new licensees for physicians and NPs, respectively, and to the average and highest supply forecasts for PAs.

Regional

Greater Bay Area

Figure 27 presents the forecasted primary care provider supply and demand for the Greater Bay Area. Similar to California overall, the forecasts indicate that the region faces a potential shortfall of primary care clinicians if growth in supply of physicians, NPs, and PAs is in the mid-range, the Greater Bay Area will have a shortage of 341 FTE primary care clinicians in 2025 and a shortage of 223 FTE primary care clinicians in 2030. If grows at the highest projected rate (7% increase in new licensees per year), the Greater Bay Area will experience a surplus of primary care clinicians sooner than California overall.

Figure 27. Forecasted Supply and Demand for Primary Care Clinician FTEs, Greater Bay Area, 2025 and 2030
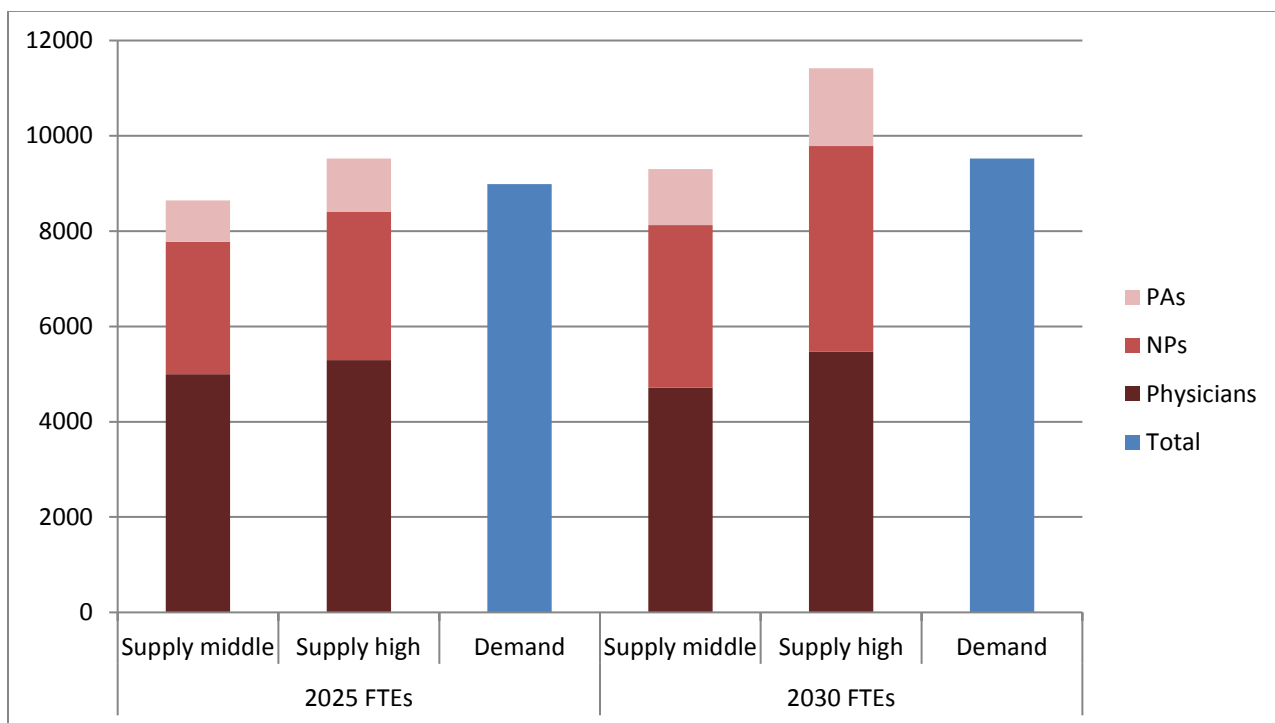

Note: The demand forecast is the average of the FTE forecast based on utilization data reported by HRSA (2013) and the FTE forecast based on physician visit data from the CHIS. "Supply middle" and "Supply high" correspond to assumptions of 3% and 7% rates of growth in new licensees for physicians and NPs, respectively, and to the average and highest supply forecasts for PAs.

Sacramento, Sierra, and Northern Counties

Forecasted primary care provider supply and demand for Sacramento, Sierra, and Northern Counties is presented in Figure 28. The forecasts indicate that the region faces a potential shortfall of primary care clinicians if growth in supply of physicians, NPs, and PAs is in the mid-range (374 FTE primary care clinicians in 2025 and 247 FTE primary care clinicians in 2030). The region would experience a small surplus in 2030 if supply grows to the highest projected levels.

Figure 28. Forecasted Supply and Demand for Primary Care Clinician FTEs, Sacramento, Sierra, and Northern Counties, 2025 and 2030
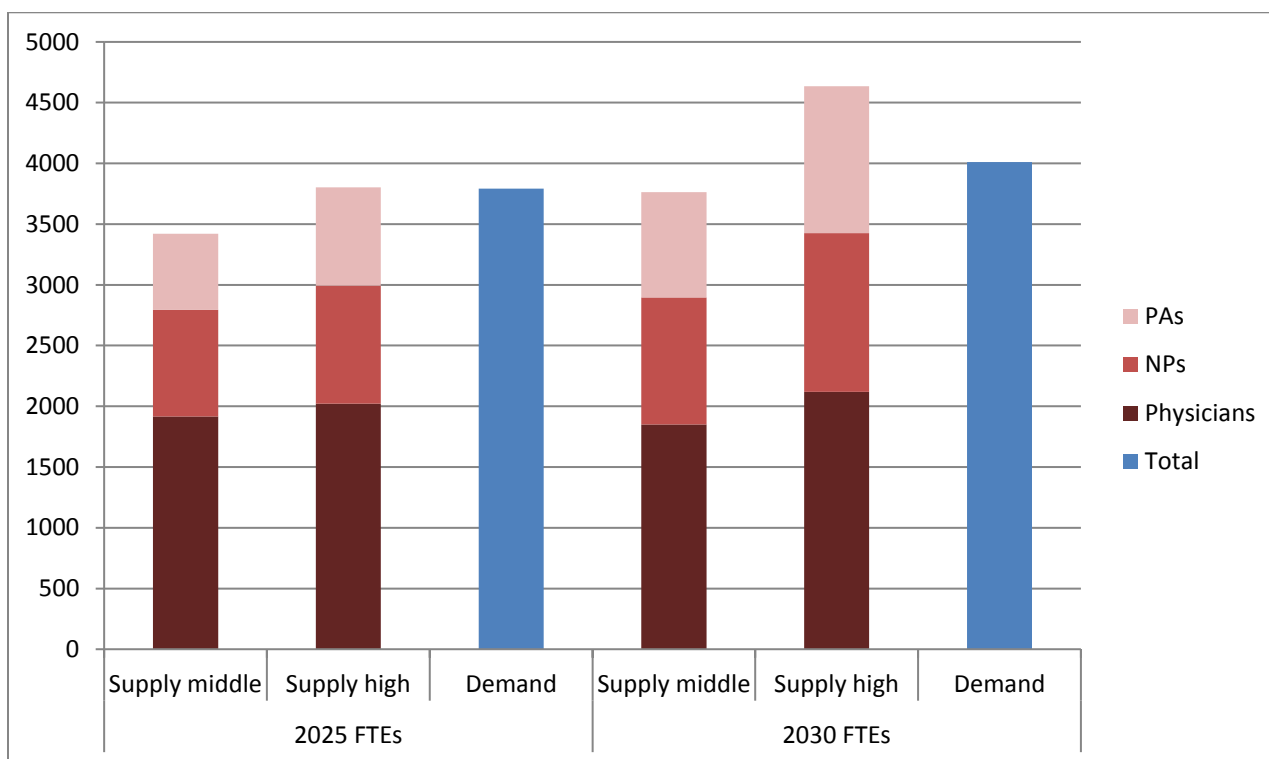

Note: The demand forecast is the average of the FTE forecast based on utilization data reported by HRSA (2013) and the FTE forecast based on physician visit data from the CHIS. "Supply middle" and "Supply high" correspond to assumptions of 3% and 7% rates of growth in new licensees for physicians and NPs, respectively, and to the average and highest supply forecasts for PAs.

Central Valley and Central Coast

Forecasts of primary care clinician supply and demand for the Central Valley and Central Coast region are presented in Figure 29. The forecasts indicate that the region faces a potential shortfall of primary care clinicians if growth in supply of physicians, NPs, and PAs is in the mid-range (1,151 FTE primary care clinicians in 2025 and 1,148 FTE primary care clinicians in 2030). A shortage is also projected in 2025 even at the highest supply projections with only a small surplus projected for 2030 if supply is at the highest levels.

Figure 29. Forecasted Supply and Demand for Primary Care Clinician FTEs, Central Valley and Central Coast, 2025 and 2030
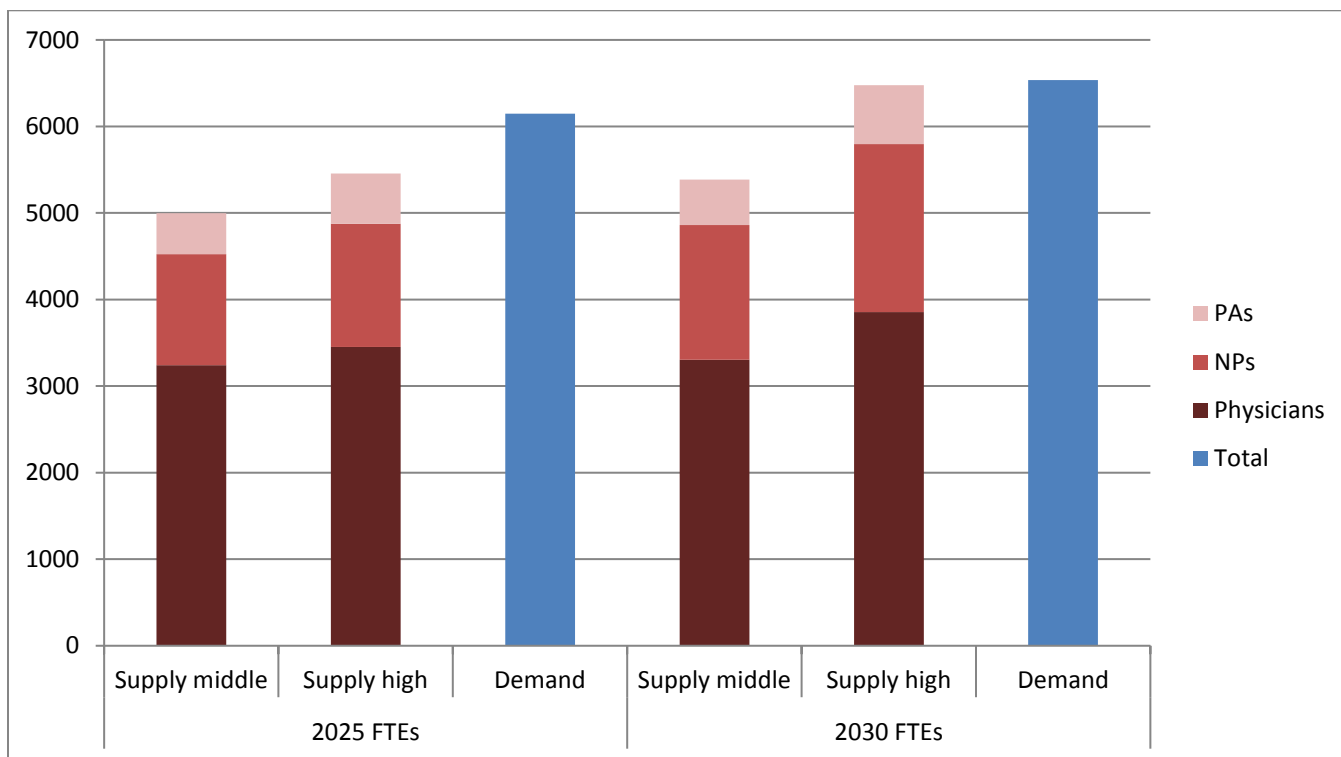

Note: The demand forecast is the average of the FTE forecast based on utilization data reported by HRSA (2013) and the FTE forecast based on physician visit data from the CHIS. "Supply middle" and "Supply high" correspond to assumptions of 3% and 7% rates of growth in new licensees for physicians and NPs, respectively, and to the average and highest supply forecasts for PAs.

Los Angeles, Orange, and Inland Empire

Figure 30 presents forecasts of primary care clinician supply and demand for the Los Angeles, Orange, and Inland Empire region. The forecasts indicate a potential shortfall of primary care clinicians if growth in supply of physicians, NPs, and PAs is in the mid-range (2,164 FTE primary care clinicians in 2025 and 1,637 FTE primary care clinicians in 2030). A small shortage is also projected in 2025 even at the highest supply projection, but a surplus is projected to emerge by 2030 if supply is at the highest levels.

Figure 30. Forecasted Supply and Demand for Primary Care Clinician FTEs, Los Angeles, Orange, and Inland Empire, 2025 and 2030

Note: The demand forecast is the average of the FTE forecast based on utilization data reported by HRSA (2013) and the FTE forecast based on physician visit data from the CHIS. "Supply middle" and "Supply high" correspond to assumptions of 3% and 7% rates of growth in new licensees for physicians and NPs, respectively, and to the average and highest supply forecasts for PAs.

Southern Border

Forecasted primary care provider supply and demand for the Southern Border region is presented in Figure 31. The forecasts indicate a shortfall of primary care clinicians if growth in supply of physicians, NPs, and PAs is in the mid-range (590 FTE primary care clinicians in 2025 and 635 FTE primary care clinicians in 2030). A shortage is also projected in 2025 even at the highest supply projections, but a small surplus is projected for 2030 if supply is at the highest levels.

Figure 31. Forecasted Supply and Demand for Primary Care Provider FTEs, Southern Border, 2025 and 2030
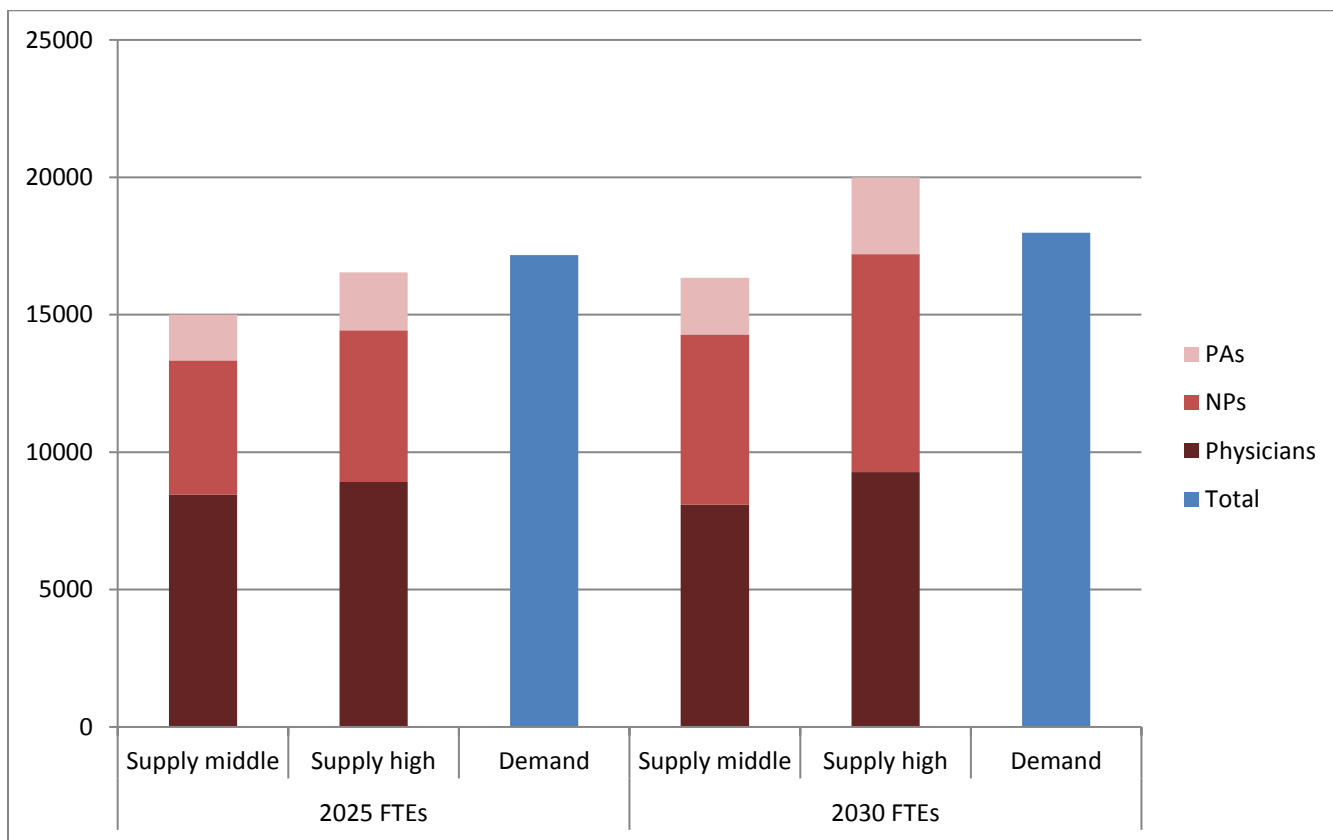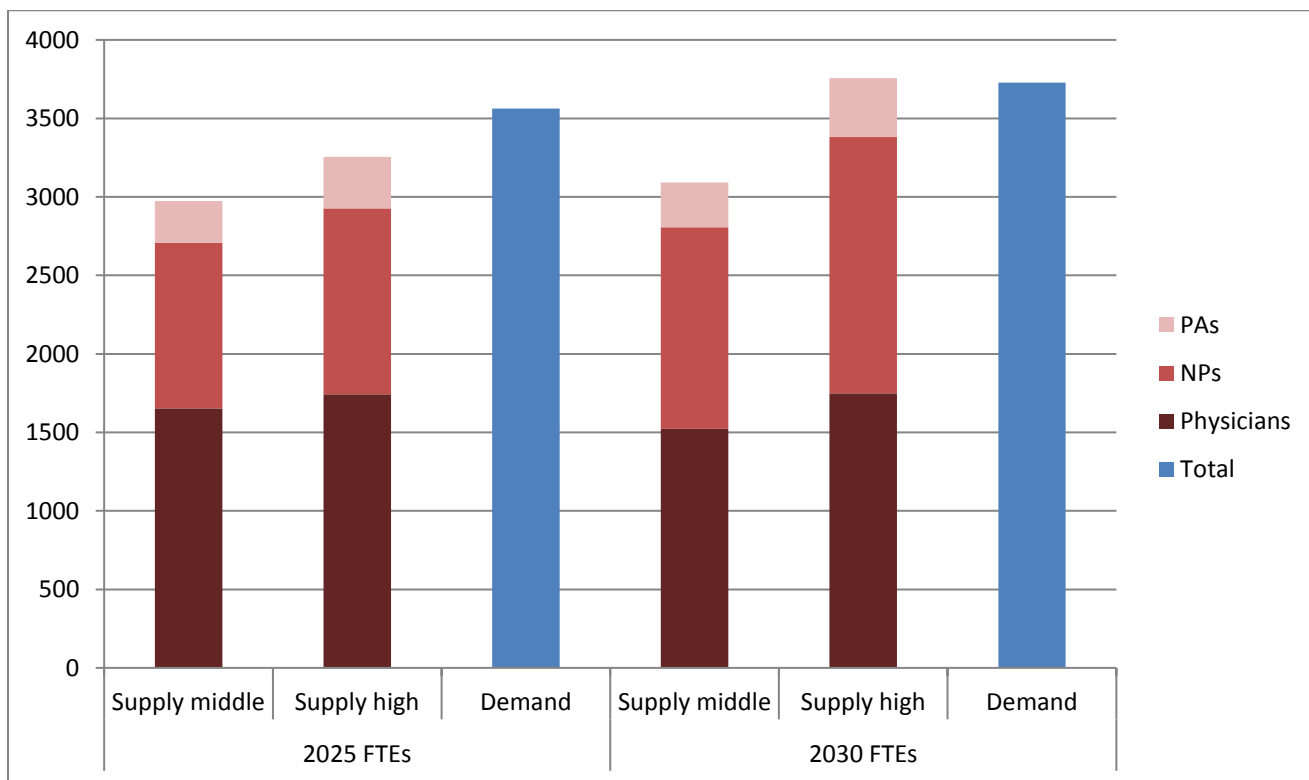

Note: The demand forecast is the average of the FTE forecast based on utilization data reported by HRSA (2013) and the FTE forecast based on physician visit data from the CHIS. "Supply middle" and "Supply high" correspond to assumptions of 3% and 7% rates of growth in new licensees for physicians and NPs, respectively, and to the average and highest supply forecasts for PAs.

Summary of Supply and Demand Comparisons

Table 5 summarizes the average of the two FTE demand forecasts and the mid-growth supply forecasts for 2025 and 2030. Statewide, these forecasts project that demand will be 11.9% greater than supply in 2025, and 9.8% greater in 2030. In percentage terms, the Greater Bay Area is projected to have the smallest shortfalls, at 3.8% in 2025 and 2.3% in 2030. The largest shortfalls are projected for the Central Valley and Central Coast region (18.7% in 2025, 17.6% in 2030) and Southern Border counties (16.6% in 2025, 17.0% in 2030).

Table 5. Summary of Demand and Mid-Growth Supply FTE Projections, by Region

	2025			2030		
	Demand	*Supply*	*Difference*	*Demand*	*Supply*	*Difference*
Statewide	39,645	34,909	-11.9%	41,759	37,656	-9.8%
Greater Bay Area	8,987	8,646	-3.8%	9,525	9,302	-2.3%
Sacramento, Sierra, and Northern	3,793	3,419	-9.8%	4,010	3,763	-6.2%
Central Valley & Central Coast	6,149	4,998	-18.7%	6,535	5,387	-17.6%
Los Angeles, Orange, Inland Empire	17,169	15,005	-12.6%	17,985	16,348	-9.1%
Southern Border	3,563	2,973	-16.6%	3,727	3,092	-17.0%

Note: The demand forecast is the average of the FTE forecast based on utilization data reported by HRSA (2013) and the FTE forecast based on physician visit data from the CHIS. The supply forecast is the sum of the physician and NP forecasts based on 3% growth in new licensees and the average PA supply forecast.

Chapter 4 – Conclusion and Policy Implications

Prior analyses have reported that the supply of primary care physicians in California is insufficient to meet the population's needs and that regional differences in supply exacerbate the shortfall in some parts of the state (Coffman, Geyn, Himmerick 2017). The forecasts of physician supply presented in this report indicate that physician supply will decline between 2016 and 2030 in nearly every supply scenario estimated. There is some variation in projected demand and supply for primary care across regions in California. The largest shortfalls in percentage terms are projected for the Central Valley and Coast region and Southern Border counties. The Central Valley and Central Coast region is also projected to have the highest population growth rate in California, increasing 16% between 2015 and 2030. It should be noted that there may be additional variation within regions. For example, the rural areas north of Sacramento are likely to experience greater shortfalls of primary care physicians than is the Sacramento metropolitan area. Limitations of available data precluded generating estimates for smaller geographic areas.

California, along with most other states, relies on NPs and PAs to help meet demand for primary care services. By 2030, nearly half of California's primary care clinician FTEs will be provided by NPs and PAs. Even so, forecasts that assume moderate growth of clinician inflows indicate that shortfalls of providers will persist through 2030. In addition, the comparisons of supply and demand forecasts may overestimate the degree to which NPs and PAs can fill the gap between physician supply and demand for primary care services. The actual shortfall of clinicians will be larger if physicians are needed to meet the primary care needs of specific populations, such as persons with highly complex conditions.

If the inflows of clinicians are at the highest levels forecasted, there may be a statewide surplus of clinicians by 2030 and some regional surpluses by 2025. The 7% growth rates in new licensees associated with these forecasts have been observed for each profession in some years over the past decade, most notably for physicians in the past two years and NPs over the past decade. However, the emergence of a surplus is unlikely. If the supply of primary care clinicians begins to exceed demand, educators are likely to reduce capacity to ensure their graduates can obtain employment. In addition, graduates will be more likely to pursue work in specialty fields, inter-state relocation for primary care jobs will slow, and international migration of primary care physicians will be attenuated. We base this conclusion on the reduction in RN education capacity in response to the perceived surplus of RNs in the early 1990s (Spetz, Rickles, & Ong 2004).

The ratios of NPs and PAs to population in California are lower than national ratios, suggesting that NPs and PAs are not being utilized as extensively in California as in the nation overall. HRSA observed that state and health care organization policies may need to change to ensure that NPs and PAs can play their optimal role in preventing shortages of primary care services (HRSA 2016). Changes in care delivery models that emphasize team-based care and liberalized scope-of-practice laws that facilitate NP and PA work in underserved areas may be required to address projected primary care clinician shortfalls (Auerbach et al., 2013).

Limitations

The forecasts presented in this report have several important limitations. First, changes in insurance coverage that could result from repeal or significant retraction of the Affordable Care Act would likely reduce demand for all health care services. Conversely, continued diffusion of value-based health insurance payment models such as expansion of accountable care organizations would likely increase demand for primary care services in ways not easily predicted. In addition, the forecasts focus solely on the numbers of clinicians needed and do not account for possible changes in the nature of primary care delivery or skills required to deliver primary care in the future. Regardless of the fate of the ACA, value-based payment, and the nature of primary care delivery, findings from previous research suggest that demand for primary care clinicians will increase due to growth in California's population and the percentage of the population that is elderly (Spetz, et al., 2014; Oberlin, et al., 2015).

Second, the forecasts are based on current patterns of supply of physicians, NPs, and PAs, and current patterns of utilizing physicians. We assumed that utilization of primary care physicians, NPs, and PAs is similar to utilization of all physicians because CHIS, our source of data on utilization, does not collect data on utilization of primary care physicians separately from utilization of specialist physicians and does not collect data on utilization of NPs and PAs.

Third, the forecasts of primary care clinician supply do not include osteopathic physicians (DOs). As described in the first report in this series, California had 6,408 DOs in 2016 along with 9,752 PAs, 19,646 NPs, and 112,929 MDs (DCA 2016). The two osteopathic medical schools in California produced 448 graduates in 2015 (AACOM 2015). Nationwide, 63% of DOs practice in primary care specialties (i.e., family medicine, general internal medicine, general pediatrics, obstetrics/gynecology) and graduates of DO medical schools are more likely to plan to pursue careers in primary care than graduates of MD medical schools (AOA 2014; AACOM 2015). If future growth in DOs in California is similar to what we project for MDs, the shortage of primary care clinicians would diminish but would not disappear.

Fourth, data on the migration patterns of PAs and the number employed in primary care is limited. The Physician Assistant Board does not survey PAs and only limited data were available from other sources such as the NCCPA and the ACS. In order to generate the forecasts, we made assumptions about migration of PAs into and out of California that were derived from NP data collected by the Board of Registered Nursing (BRN). We also utilized BRN data on NPs to estimate the percentage of PAs working in their field. Our findings would change if PAs' migration and employment patterns are not similar to those of NPs.

Recommendations

Multiple strategies at national, state, and regional levels will be required to fill the potential gap between primary care demand and supply forecasted in this report. Steps that California policymakers, educators, and health care delivery organizations can take to ensure an adequate supply of primary care clinicians to meet future demand include:

- Actively recruiting primary care physicians to practice in California–both physicians completing California-based primary care residency programs and those from outside the state.

- Expanding primary care residency programs, particularly in the regions most at risk for a long-term shortage, such as the Central Valley and Central Coast.

- Improving retention of physicians, particularly those who are younger and can contribute many years of service to Californians.

- Ensuring 3-7% annual growth in graduations from NP and PA education programs so that the number of graduates keeps pace with projected demand.

- Expanding team-based primary care models that maximize the use of all clinicians and supporting alignment of insurance reimbursement with team-based care.

- Ensuring that scope-of-practice regulations for NPs and PAs maximize their capacity to provide primary care and to work at the highest level of their education and knowledge.

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Technical Appendix

Definitions

Primary Care Clinicians

This report defines "primary care clinicians" persons in the following professions who practice in "primary care specialties": allopathic physicians (MDs), osteopathic physicians (DOs), nurse practitioners (NPs), and physician assistants (PAs).

Primary Care Specialties

This report defines "primary care specialties" as encompassing the following specialties: family medicine/general practice, general internal medicine, general pediatrics, and obstetrics/gynecology. While obstetrician/gynecologists (OB/GYNs) are not always included in the definition of "primary care physicians (PCPs)" in workforce research, we chose to include them since a large number of women of child-bearing age visit their OB/GYN more frequently than their PCP and since some services that OB/GYNs provide, such as screening for asymptomatic disease, fall within the scope of what is typically considered primary care.

Full Time Equivalent (FTE)

"FTE" is a unit that expresses the workload of an employee as a ratio adjusted to the number of hours in a typical work week (usually 40 hours). For example, the workload of an employee who typically works 40 hours per week can be expressed as 1.0 FTE and the workload of an employee who works 60 hours per week can be expressed as 1.5 FTE.

FTEs are used in this report to offer a more precise estimate of the actual supply of primary care clinicians since the number of employed clinicians can misrepresent the number of care hours provided. For example, a particular region may have 500 employed clinicians but only 350 clinician FTEs if some clinicians work part-time (i.e. less than 40 hours per week). Conversely, another region may have 100 employed clinicians and 150 clinician FTEs if some clinicians work more than 40 hours per week.

Regions

Forecasts presented in this report were developed for the state as a whole and for five regions: Greater Bay Area; Sacramento, Sierra, and Northern counties; Central Valley and Central Coast; Los Angeles, Orange, and Inland Empire; and Southern Border. These delineations are based on the regions used by the California Health Interview Survey (CHIS); some CHIS regions are merged because labor markets are generally larger than primary care service markets and because some regions do not have sufficient data to examine them independently.

Region	Counties included
Greater Bay Area	Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma
Sacramento, Sierra, and Northern	Alpine, Amador, Butte, Calaveras, Colusa, Del Norte, El Dorado, Glenn, Humboldt, Inyo, Lake, Lassen, Mariposa, Mendocino, Modoc, Mono, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Tuolumne, Yolo, Yuba
Central Valley & Central Coast	Fresno, Kern, Kings, Madera, Merced, Monterey, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Stanislaus, Tulare, Ventura
Los Angeles, Orange, Inland Empire	Los Angeles, Orange, Riverside, San Bernardino
Southern Border	Imperial, San Diego

Source: California Physicians: Surplus or Scarcity. Oakland, CA: California Health Care Foundation, 2014.

Where possible, clinicians' primary practice addresses were utilized to determine the county and, subsequently, the region in which they are located. For some clinicians, only a residential address was available. For these clinicians, the primary residential address was utilized to assign clinicians to counties and regions. This means that some clinicians may be classified as providing care in their county of residence despite actually practicing in a different county. This may affect estimates of numbers of primary care clinicians by region because some persons may reside in a county in one region and commute to work in a county in another region. For example, some primary care clinicians who practice in the Los Angeles region may be misclassified as practicing in the Orange County region or the Central Coast region if they live in Orange County or Ventura County and only a residential address is available.

Data Sources

National Data Sources

U.S. Census Bureau

Additional information describing the Census data product utilized for this report is provided below.

Annual Estimates of the Resident Population

California population estimates at the state and regional levels were obtained from the Census Bureau of the Economic and Statistics Administration Population Estimates Program (PEP). The estimates generated by PEP are benchmarked to the most recent decennial census (2010) and are reflective of currently available data on births, deaths, and migration. County-level population estimates sourced from the Annual Estimates of the Resident Population (PEPANNRES) were aggregated into the nine CHIS regions described above. These data were used to calculate ratios of clinicians per 100,000 population. In each context, the most current data available were utilized.

The population estimates found in this report can be accessed using the PEPANNRES table, available via American Fact Finder here.

American Community Survey

Several components of analysis presented in this report were conducted using data sourced from the 2011-2015 5-year American Community Survey (ACS) Public Use Microdata Sample (PUMS) file. PUMS data allow researchers to describe a range of population characteristics that are not in the summary table available through American Fact Finder. In this report, PUMS data were used primarily for the description of physician assistants' geographic distribution, employment rate, and average weekly hours worked. Additional technical information about PUMS can be found on the "About PUMS" page here as well as in the Design and Methodology Report here.

The ACS is not designed specifically for analysis of the health professions workforce. However, because PUMS data describe population characteristics at the individual person-level (i.e. each observation in the dataset represents one person's responses to the survey questions), the UCSF research team was able to limit the analysis to only those individuals most likely to be working as one of the health care providers that are the focus of this report. For example, persons who were not employed or out of the labor force for some other reason at the time of the survey were excluded. Persons whose reported level of educational attainment was not sufficient to meet the requirements for professional licensure in California also were excluded. Finally, it should be acknowledged that regional analysis of individual health professions was possible only by using the 5-year ACS PUMS file, which aggregates responses from survey participants over a five-year period. This file was used to ensure a sufficient number of sample cases from which to generate statistically valid estimates. The findings presented in this report sourced from the 5-year ACS PUMS file should be interpreted as a five-year average over the period 2011-2015.

State Data Sources

UCLA Center for Health Policy Research, California Health Interview Survey.

The California Health Interview Survey (CHIS) is a large, statewide health survey that asks questions on a wide range of health topics. It is especially useful because it provides representative data on all 58 counties in California. Separate questionnaires are used to survey the three age-based respondent groups: Adults, Teens/Adolescents, and Children, so there is some variation in how questions are phrased and variables coded.

The analysis for this report is based on the 2015 Public Use One-year Data Files (Files) formatted for the STATA statistical software. There is a separate file for each of the three age-based groups surveyed by CHIS (Adults, Teens/Adolescents, and Children), which reflects the differences in question phrasing and visit-based usage buckets for categorical variables.

California Department of Finance, Demographic Research Unit.

The Demographic Research Unit at the California Department of Finance (DoF) releases population projections. The UCSF team used county-level projections through 2030 as part of its primary care demand forecast model.

Department of Consumer Affairs Licensee Masterfile, obtained June 15, 2016.

The Department of Consumer Affairs (DCA) maintains a database of over 150 professional license types for the various licensing boards it oversees, including the licensing boards that regulate MDs, NPs, and PAs. The research team obtained these data using a standard public information request form. All counts of licensed professionals presented in this report (based on DCA data) reflect individuals whose record indicated an "active" license as of June 15, 2016 (records marked "inactive", "expired" or "delinquent" were excluded). In addition, individuals whose address of record was in a state outside of California were omitted from these counts under the assumption they are not currently practicing in California.

It is important to note that DCA data do not indicate whether licensed individuals practice in the profession for which they are licensed or whether they are employed at the time of data collection (e.g. someone with an active Licensed Clinical Social Worker license may be employed in an unrelated profession/industry or unemployed/out of the labor force altogether). As a result, the DCA data do not provide any information describing practice/employment activities; there is no way to know the extent to which a licensed individual is engaged in direct patient care versus other activities such as teaching, administration, or research. Thus, counts of licensed professionals presented in this report may overstate the actual supply of health care providers.

Medical Board of California Mandatory and Supplemental Surveys.

The Medical Board of California (MBC) is the regulatory body that oversees the licensing of allopathic physicians (MDs) in California. California law[1] requires the MBC to administer a survey to MDs every two years as part of the licensure renewal process. The survey asks about licensees' professional activities in medicine, the number of hours they work, their medical specialty, the zip code of their practice, training status (i.e. whether a licensee is a resident or fellow), race/ethnicity, and languages spoken other than English.

For counts of actively licensed primary care physicians, MDs were excluded based on the following criteria:

[1] Business & Professions Code sections 803.1, 2425.1 and 2425.3

- **_"Not in 2-Year Cohort"_:** This criterion removes respondents who did not renew an existing license or establish a new license (in the case of recent medical school graduates) within two years of the survey's distribution.

- **_"Practicing Out-of-State"_:** This criterion removes respondents who report that their primary practice location is outside the state of California regardless of their residence address. For example, physicians living on the California side of Lake Tahoe who primarily practice in the state of Nevada would be omitted from this analysis.

Additionally, MDs' training status was used to identify the number of licensed MDs in the educational pipeline for active primary care physicians per the following criterion:

- **_"Residents/Fellows"_:** This criterion flags respondents who identify as either residents or fellows to ensure they are counted as trainees rather than active primary care physicians. These physicians are considered trainees for purposes of this report because they have not completed all training required to practice in their chosen specialties.

As with the nurse practitioner (NP) and physician assistant (PA) pipelines, different assumptions about the growth of MD trainees informed several forecasting scenarios. In turn, these scenarios generated region-level and statewide projections of the contribution of MDs to the primary care clinician workforce.

The MBC mandatory survey asks respondents to identify their primary and secondary specialties from among 55 "Areas of Practice" (e.g., Allergy and Immunology, Internal Medicine). The UCSF team developed an algorithm to collapse the 55 "Areas of Practice" into eleven distinct categories: Emergency Medicine, Facility-Based Medicine, Family Medicine, General Surgery, General Internal Medicine, Medical Specialty, Obstetrics/Gynecology, Pediatrics, Psychiatry, Surgical Specialty, and Other Specialty. In the 2015 MBC Survey, 237 active patient care physicians (0.4%, N=61,196) could not be classified into any of these nine categories. The four categories used to identify primary care providers (PCPs) for this report are: Family Medicine, General Internal Medicine, Obstetrics/Gynecology, and Pediatrics.

California Board of Registered Nursing/UCSF

In 2010, the California Board of Registered Nursing contracted with UCSF to conduct a survey of a sample NPs and certified nurse midwives (CNMs) in California. Usable responses were received from 1,365 NPs located in California. Responses to a survey question regarding NPs' clinical specialties were used to estimate the number and percentage of NPs in California who provide primary care.

Professional Association Data Sources

Physician Assistants (PAs)

National Commission on Certification of Physician Assistants (NCCPA)

Many of California's physician assistants (PAs) are certified by the National Commission on Certification of Physician Assistants (NCCPA). NCCPA collects the most comprehensive data on PAs in the US. In a private request, NCCPA reported these data to the UCSF team at the CHIS region level; the data are reflective of the extent to which individual respondents to NCCPA survey instruments answer specific survey questions. Certified PAs' responses to NCCPA survey instruments were used to inform forecasts of PA supply, including the share of active California PAs practicing in primary care settings.

Physician Assistant Education Association (PAEA)

The Physician Assistant Education Association (PAEA) represents all of the accredited PA programs in the United States. Using several years of PAEA Annual and Program Reports, the UCSF team was able to identify trends in the number of individuals completing PA training in California. These trends informed the assumptions made about projected changes to California's PA educational pipeline.