California Physician Workforce

Supply and Demand through 2015

December 2004

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PREFACE

This report presents an in depth analysis of the current physician workforce and forecasts of the future physician workforce in California. The report presents forecasts of the physician supply and demand in the state through 2015 under a number of scenarios, as well as broader discussions of the changing population demographics in California and issues related to physician workforce planning and analysis. This report was prepared for and with funding from the University of California Office of Health Affairs. It is an important component of the major health sciences planning effort initiated by the University of California Office of Health Affairs and University of California Health Sciences Committee during the 2000-01 academic year. The report is intended to provide useful information for educators, policy makers, and other interested parties.

This report was prepared by the Center for Health Workforce Studies at the University of Albany, State University of New York. The Center is dedicated to the collection, analysis, and distribution of health workforce data to assist health, professional and educational organizations, policy makers, and the public understand issues related to the supply, demand, distribution, and use of health workers. This report was prepared by Gaetano J. Forte (day-to-day project management; physician supply and demand scenario development; liaison with physician workforce forecasters; demographic analysis; physician analysis; data compilation; and report development), Sandra McGinnis (demographic analysis; physician analysis; and report development), Mark Beaulieu (physician analysis), Beth Hernandez (background research), and Edward Salsberg (project direction; liaison with University of California Office of Health Affairs; report review; executive summary development). The views expressed in this report are those of the Center for Health Workforce Studies and do not necessarily represent positions or policies of the University at Albany, State University of New York, the University of California Office of Health Affairs, the University of California Health Sciences Committee, or the University of California.

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EXECUTIVE SUMMARY

An adequate supply and distribution of physicians is an essential component of an effective health care system. While there is no simple method or ratio to determine how many physicians a state or region should have, it is possible to assess available data on the population to be served and on the physician workforce and to apply existing forecasting models for supply and demand to a state or region to inform physician workforce decisions. While it may seem far off, it is prudent to seriously assess medical education and training needs for 2015 and beyond. It takes extensive effort and time to add or eliminate a medical school or to expand medical school enrollment, and it takes an individual 7 to 10 years of education and training after obtaining an undergraduate degree to prepare for medical practice. Thus, the nature of the education and training requirements of the profession as well as the many factors that will affect the supply and demand for physicians over the next decade present an enormous challenge to planners.

Planning for 2015 and beyond is particularly important in states like California that are expected to grow significantly in the coming years. The California Department of Finance forecasts that the state population will grow by 7.7 million people (22%) between 2000 and 2015. This additional population alone is greater than the population of all but 11 states.

The University of California plays a central role in educating and training the California physician workforce: 48% of all medical school graduates in 2002 in California graduated from one of the 5 University of California medical schools; and a significant proportion of all physicians in training in the state are in residency programs sponsored by or affiliated with University of California medical schools. As part of its effort to plan for the future, the University of California, Office of Health Affairs contracted with the Center for Health Workforce Studies at the University at Albany for a study of the supply and demand for physicians in California through 2015. Funding for this report was made possible by a grant to the Office of Health Affairs from The California Endowment, a private, statewide health foundation whose mission is to expand access to affordable, quality health care for underserved individuals and communities, and to promote fundamental improvements in the health status of all Californians.

To inform the analysis and the planning process, the University of California also requested that the Center for Health Workforce Studies prepare a comprehensive profile of the current California population and likely 2015 population, as well as a comprehensive profile of the physician workforce in the state and forecasts of supply and demand for physicians through 2015. Key questions to be answered included: Is the supply of physicians in California likely to be sufficient to meet the demand for physician services in 2015? How would the adequacy of the physician supply be affected if more Californians had health insurance coverage?

There are many factors to be accounted for when forecasting supply and demand for physician services in the future. These include, but are not limited to, medical advances; potential changes in the health care

delivery system; physician practice patterns; changes in health insurance coverage; physician migration patterns; and cost-containment policies. In order to help address these factors, this report presents a number of scenarios and includes estimates of the potential impact on future supply and demand of changes in key assumptions related to these scenarios. When all of the factors and assumptions are accounted for, the analysis indicates that between 2002 and 2015 growth in physician demand in the state is likely to outpace growth in physician supply by between 4.7% and 15.9%. Thus, the state is likely to face a physician shortage in 2015. The expected magnitude of the shortage varies between 4,961 and 16,985 physicians, or between 12 and 40 physicians per 100,000 population in 2015.

Key Findings

The California Population

- California is already by far the most populous state in the nation with 34.7 million residents in 2000. California has 13 million more residents than the second most populous state.

- Importantly, the population of California is growing rapidly: between 1990 and 2000, California added more than 4.7 million people (15.7%); and between 2000 and 2015, California's population is expected to grow by more than 7.7 million (22.3%). This growth could place great strains on the health care delivery system and the physician workforce.

- The elderly population of California is growing rapidly. The population over 65 is expected to grow by more than 1.5 million between 2000 and 2015. The population over 65 uses a great deal of the services provided by physicians.

- California includes some of the nation's largest urban areas. The majority of the state lives in three areas: Los Angeles County (9.8 million), the Bay Area (7.2 million) and San Diego County (2.9 million).

- Population growth between 2002 and 2015 is expected to vary considerably by region, ranging from nearly 50% in the Inland Empire region to less than 10% in Los Angeles County.

- The population of California is already very diverse in terms of race and culture and will become even more so in the future. By 2015, nearly 37% of the population will be of Hispanic/Latino origin and nearly 14% will be of Asian or Pacific Islander heritage. Currently, Hispanic/Latino(a)s are far less likely to report having health insurance than other population groups.

- More than 1 in 4 Californians were born outside of the U.S., the highest proportion of any state.

The California Physician Workforce

- In 2002, more than 90,470 physicians were active in California. Of these, nearly 9,500 were in residency/fellowship training, and another 11,700, while active, were not providing patient care services.

- Overall, in 2002, California had 193 active patient care physicians (excluding physicians in training) for each 100,000 people residing in the state, a figure close to the national average of 200 (excluding physicians in training). However, there are great variations among counties, ranging from greater than 400 per 100,000 in Marin and San Francisco Counties to no physicians at all in Alpine and Sierra Counties.

- Physicians are concentrated in the large cities and counties of the state. Nearly 60% of the 69,252 physicians who were providing patient care services (excluding physicians in training), were located in just 5 counties: 19,778 (28.6%) were in Los Angeles County; 6,733 (9.7%) were in Orange County; 6,303 (9.1%) were in San Diego County; 4,090 (5.9%) were in Santa Clara County; and 3,425 (5.4%) were in San Francisco County.

- The diversity of the physician workforce is very limited compared to the population of the state: only 4.4% of the physicians were Hispanic/Latino compared to nearly 31% of the general population in 2000; 3% of the physicians were African-American/Black compared to nearly 7% of the population; about 0.1% of the physicians were Native American/Alaskan compared to nearly 1% of the population. Overall, only 7.5% of the patient care physicians in California were under-represented minorities.

- More than 26,000 physicians were over age 55 in 2000. Many of these physicians are likely to retire by 2015; nearly 33% of the practicing physicians over 55 are in primary care specialties (General Internal Medicine, Family Medicine and General Pediatrics).

- A growing proportion of physicians in the state are female; while 24% were female overall in 2002, 36% of those between ages 35 and 44 were female.

- The majority of practicing physicians (50%) attended medical school in states other than California; only 26% attended medical school (allopathic or osteopathic) in California; the remaining 24% attended medical school in other countries.

California Medical School and GME Capacity

- In 2002, 1,368 physicians completed their medical education at one of the 10 medical schools (allopathic or osteopathic) in California. Of those, 657 (48%) were graduates of University of California medical schools.

- In 2002, there were only 15.6 enrolled medical students (allopathic and osteopathic) for each 100,000 people living in the state compared to 27.1 per 100,000 in the U.S. as a whole. New York has the highest concentration of enrolled medical students with 42.5 per 100,000 population. Another populous state, Texas, has 24.0 enrolled medical students per 100,000 population.

- While the population of California grew 14% between 1992 and 2002, the number of students enrolled at the 5 University of California medical schools did not change. (Although 15 more physicians graduated from a University of California medical school in 2002 than in 1992, this was due to an increase in the number of students taking extended time to complete their studies rather than an increase in enrollment.) Private medical schools (particularly osteopathic medical schools) greatly increased their enrollments during that period leading to an overall increase of 32% in the number of medical school graduates per year, from 1,038 in 1992 to 1,368 in 2002.

- In 2002, there were approximately 9,452 physicians in residency and fellowship positions in California. This is equal to 26.4 residents/fellows per 100,000 population in the state, only 77% of the ratio of residents/fellows to 100,000 population in the U.S. (34.1).

- In 2002, California accounted for approximately 12% of the U.S. population, but only 7% of the nation's medical students and 9% of the nation's physicians in graduate medical training.

- In 2002, only 43% of the 1,936 Californians who entered a U.S. allopathic medical school were attending an allopathic medical school in California. The remainder (57%) had left the state to attend medical school.

Forecasting the Supply of and Demand for Physicians in California through 2015

Most forecasting models, of necessity, forecast future physician supply and demand based on prior practice patterns and historical utilization patterns. It is possible, however, to determine the impact on the projections of certain changes from the historical patterns. The supply and demand models presented in this report are based upon various possible scenarios of the future, including changes in insurance coverage, the California economy, and physician practice patterns. Depending upon how these factors play out in California's future, physician demand is forecast to outgrow physician supply by 4.7% to 15.9% between 2002 and 2015. The resultant shortage in 2015 is expected to range between 4,961 and 16,985 physicians, or between 12 and 40 physicians per 100,000 population.

Demand:

Two environments were simulated to forecast demand for physicians. First, the historical level of health insurance status was considered (constant insurance environment). Second, an environment where all residents of the state were insured was constructed (expanded insurance environment). It is further assumed in the expanded insurance environment that the newly insured population would use services at the same rate as the already insured population.

In each of the simulated environments, six demand scenarios were modeled that considered a number of factors:

- the historical, current and projected physician utilization rates by age, gender, metropolitan/nonmetropolitan designation, and type of health insurance of California's population applied to the projected state population (demand scenarios 1, 2, 3, 4, 5, and 6);
- the positive relationship between economic growth and physician demand; i.e., as per capita gross state product increases, physician demand increases (demand scenarios 2 and 5);
- the potential change in age-specific physician utilization rates following national trends observed between 1990 and 2000; i.e., among those 45 years of age and older, physician utilization rates increased, and among those under age 45, physician utilization rates decreased (demand scenarios 3 and 6); and
- the potential reduction in the number of unnecessary/marginally beneficial services currently provided by physicians (demand scenarios 4, 5, and 6).

The results were as follows:

<u>Constant Insurance Environment</u>

- Demand Scenario 1 (Baseline) forecast physician demand under the assumption that rates of health care use remain constant over time by applying these rates to the projected future population of the state. Under this scenario, physician demand would increase from 90,470 in 2002 to 109,461 in 2015 (a 21% increase). The forecast growth is equivalent to a 2.2% increase in the physician demand per 100,000 population in the state.

- Demand Scenario 2 (Economic Expansion) explicitly accounted for the positive relationship between economic growth and physician demand. The scenario forecast physician demand under the assumptions that California's per capita gross state product increases by 1% annually and that demand for physicians increases by 0.75% annually for every 1% annual growth in the per capita gross state product. Under this scenario, physician demand would increase from 90,470 in 2002 to 119,830 in 2015 (a 33% increase). The forecast growth is equivalent to an 11.9% increase in the physician demand per 100,000 population in the state. It should be noted that the relationship modeled in demand scenario 3 is not controlled for in this scenario.

- Demand Scenario 3 (Changing Age-Specific Physician Utilization Rates) forecast physician demand under the assumption that the age-specific physician utilization rates in the state would change in the same way between 2002 and 2015 as has been observed nationally between 1990 and 2000. Under this scenario, physician demand would increase from 90,470 in 2002 to 118,052 in 2015 (a 31% increase). The forecast growth is equivalent to a 10.3% increase in the physician demand per 100,000 population in the state. It should be noted that the relationship modeled in demand scenario 2 is not controlled for in this scenario.

- Demand Scenario 4 (Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the assumption that 5% of the services provided by physicians are unnecessary/marginally beneficial and that those services would be eliminated by 2015. Under this scenario, physician demand would increase from 90,147 in 2002 to 103,988 in 2015 (a 15% increase). The forecast growth, in this case, is equivalent to a 2.5% decrease in the physician demand per 100,000 population in the state.

- Demand Scenario 5 (Economic Expansion and Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the combined assumptions of demand scenarios 2 and 4. Under this scenario, physician demand would increase from 90,147 in 2002 to 113,839 in 2015 (a 26% increase). The forecast growth is equivalent to a 6.7% increase in physician demand per 100,000 population in the state.

- Demand Scenario 6 (Changing Age-Specific Physician Utilization Rates and Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the combined assumptions of demand scenarios 3 and 4. Under this scenario, physician demand would increase from 90,147 in 2002 to 112,149 in 2015 (a 24%) increase. The forecast growth is equivalent to a 5.1% increase in physician demand per 100,000 population in the state.

Expanded Insurance Environment

In the expanded insurance environment, all state residents have health insurance and use physician services at the same rate as the historically insured population.

- Demand Scenario 1 (Baseline) forecast physician demand under the assumption that rates of health care use remain constant over time by applying these rates to the projected future population of the state. Under this scenario, physician demand would increase from 90,470 in 2002 to 119,847 in 2015 (a 33% increase). The forecast growth is equivalent to an 11.9% increase in the physician demand per 100,000 population in the state.

- Demand Scenario 2 (Economic Expansion) explicitly accounted for the positive relationship between economic growth and physician demand. The scenario forecast physician demand under the assumptions that California's per capita gross state product increases by 1% annually and that demand for physicians increases by 0.75% annually for every 1% annual growth in the per capita gross state product. Under this scenario, physician demand would increase from 90,470 in 2002 to 131,200 in 2015 (a 45% increase). The forecast growth is equivalent to a 22.5% increase in the physician demand per 100,000 population in the state. It should be noted that the relationship modeled in demand scenario 3 is not controlled for in this scenario.

Table ES-1

Projected Growth in Demand for Physicians per 100,000 Population in California, 2002-2015

	Constant Insurance Environment	Expanded Insurance Environment	
Demand	**% Growth**	**% Growth**	**Scenario Description**
Scenario 1	2.2%	11.9%	Baseline (*Demand Scenario 1*)
Scenario 2	11.9%	22.5%	Economic Expansion (*Demand Scenario 2*)
Scenario 3	10.3%	18.3%	Age-specific Physician Utilization Rate Changes (*Demand Scenario 3*)
Scenario 4	-2.5%	6.7%	Unnecessary/Marginally Beneficial Services Eliminated (*Demand Scenario 4*)
Scenario 5	6.7%	16.8%	Economic Expansion + Unnecessary/Marginally Beneficial Services Eliminated (*Demand Scenario 5*)
Scenario 6	5.1%	12.8%	Age-specific Physician Utilization Rate Changes + Unnecessary/Marginally Beneficial Services Eliminated (*Demand Scenario 6*)

- Demand Scenario 3 (Changing Age-Specific Physician Utilization Rates) forecast physician demand under the assumption that the age-specific physician utilization rates in the state would change in the same way between 2002 and 2015 as has been observed nationally between 1990 and 2000. Under this scenario, physician demand would increase from 90,470 in 2002 to 126,636 in 2015 (a 40% increase). The forecast growth is equivalent to an 18.3% increase in the physician demand per 100,000 population in the state. It should be noted that the relationship modeled in demand scenario 2 is not controlled for in this scenario.

- Demand Scenario 4 (Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the assumption that 5% of the services provided by physicians are unnecessary/marginally beneficial and that those services would be eliminated by 2015. Under this scenario, physician demand would increase from 90,147 in 2002 to 113,855 in 2015 (a 26% increase). The forecast growth is equivalent to a 6.7% increase in the physician demand per 100,000 population in the state.

- Demand Scenario 5 (Economic Expansion and Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the combined assumptions of demand scenarios 2 and 4. Under this scenario, physician demand would increase from 90,147 in 2002 to 124,640 in 2015 (a 38% increase). The forecast growth is equivalent to a 16.8% increase in physician demand per 100,000 population in the state.

- Demand Scenario 6 (Changing Age-Specific Physician Utilization Rates and Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the combined assumptions of demand scenarios 3 and 4. Under this scenario, physician demand would increase from 90,147 in 2002 to 120,304 in 2015 (a 34%) increase. The forecast growth is equivalent to a 12.8% increase in physician demand per 100,000 population in the state.

Supply:

A straightforward supply model was constructed to forecast future physician supply in the state. Four scenarios were developed by considering a number of factors:

- the current number of total physicians located in California (supply scenarios 1, 2, 3, and 4);

- physician separation rates (rates of retirement, moving out of practice, death) based on national estimates of these rates (supply scenarios 1, 2, 3, and 4);

- the number of new entrants (first year residents with no prior U.S. residency training) to residency training in California (supply scenarios 1, 2, 3, and 4);

- net migration of Californian physicians (supply scenarios 1, 2, 3, and 4);

- the demographic evolution in the physician workforce and its effects on aggregate physician work effort (supply scenarios 2 and 4); and

- the potential productivity gains generated by technological advances in the practice of medicine (supply scenarios 3 and 4).

The results were as follows:

- Supply Scenario 1 (Baseline) forecast physician supply under the assumption patterns of physician production, separation and migration remain constant over time. Under this scenario, physician supply would increase from 90,470 in 2002 to 107,464 in 2015 (a 19% increase). The forecast growth is equivalent to a 0.4% increase in the physician supply per 100,000 population in the state.

- Supply Scenario 2 (Lifestyle Changes) forecast physician supply under the assumption that physicians would reduce the number of hours they spend in practice by 10% by 2015. Under this scenario, physician supply would increase from 90,470 in 2002 to 101,013 in 2015 (a 12% increase). The forecast growth is equivalent, in this case, to a 5.7% decrease in the physician supply per 100,000 population in the state.

- Supply Scenario 3 (Productivity Enhancements) forecast physician supply under the assumption that physician productivity would increase by 5% by 2015. Under this scenario, physician supply would increase from 90,470 in 2002 to 113,017 in 2015 (a 25% increase). The forecast growth is equivalent to a 5.6% increase in the physician supply per 100,000 population in the state.

- Supply Scenario 4 (Lifestyle Changes and Productivity Enhancements) forecast physician supply under the combined assumptions of supply scenarios 2 and 3. Under this scenario, physician supply would increase from 90,470 in 2002 to 105,904 in 2015 (a 17% increase). The forecast growth is equivalent, in this case, to a 1.1% decrease in the physician supply per 100,000 population in the state.

Table ES-2

Projected Growth in Supply of Physicians per 100,000 Population in California, 2002-2015

Supply	% Growth	Scenario Description
Scenario 1	0.4%	Baseline (*Supply Scenario 1*)
Scenario 2	-5.7%	10% Reduction in Work Hours (*Supply Scenario 2*)
Scenario 3	5.6%	5% Increase in Productivity (*Supply Scenario 3*)
Scenario 4	-1.1%	10% Reduction in Work Hours and 5% Increase in Productivity (*Supply Scenario 4*)

Adequacy of the Future Supply of Physicians in California in 2015

The assessment of the adequacy of the future physician supply in California in 2015 was accomplished by considering the forecasts of physician supply and demand. The analysis indicates that California will face a physician shortage by 2015, although the magnitude of the shortage varies based upon the supply scenario used. Summaries of the findings for each scenario are presented in the table below.

Table ES-3

Mean Percentage Difference between Projected Growth in Demand for and Projected Growth in Supply of Physicians per 100,000 Population in California by Supply Scenario, 2002-2015*

Supply	Mean Difference Demand Growth per 100,000 Population relative to Supply Growth per 100,000 Population	Scenario Description
Scenario 1	9.8%	Baseline (*Supply Scenario 1*)
Scenario 2	15.9%	10% Reduction in Work Hours (*Supply Scenario 2*)
Scenario 3	4.7%	5% Increase in Productivity (*Supply Scenario 3*)
Scenario 4	11.3%	10% Reduction in Work Hours and 5% Increase in Productivity (*Supply Scenario 4*)

** Calculated as* $\Sigma(\text{Percentage Demand Growth}_{ij} - \text{Percentage Supply Growth}_{k})/(N)|\text{Supply}_{k}$, *where i = insurance environment, j = demand scenario, k = supply scenario, and N=12 (2 insurance environments * 6 demand scenarios);*[1] *positive differences indicate demand growing faster than supply (i.e., a physician shortage).*

Under each supply scenario, the average (mean) difference between growth in demand per 100,000 population and growth in supply per 100,000 through 2015 is positive, indicating that demand is forecast to grow more rapidly than supply during the period. By 2015, physician demand per 100,000 population is projected to have grown between 4.7% and 15.9% more than physician supply per 100,000 population in the state. Thus, California is likely to face a physician shortage in 2015. In terms of numbers of physicians, the shortage is projected to range between 4,961 and 16,985 physicians, or between 12 and 40 physicians per 100,000 population in 2015.

Options for Promoting a Balance of Physician Supply and Demand in 2015

The assessment of physician supply and demand in California in 2015 indicates that the state is likely to face an overall shortage of physicians in the range of 5% to 16%. In addition, there are some communities that are likely to experience more serious shortages than other areas and specialties.

There are a number of strategies to be considered to address the projected shortages and mal-distribution of physicians. These strategies include:

[1] For example, for supply scenario 1, the mean difference is calculated as [(2.2%-0.4%) + (11.9%-0.4%) + (10.3%-0.4%) + (-2.5%-0.4%) + (6.7%-0.4%) + (5.1%-0.4%) + (11.9%-0.4%) + (22.5%-0.4%) + (18.3%-0.4%) + (6.7%-0.4%) + (16.8%-0.4%) + (12.8%-0.4%)]/12 = 9.8%

1. Increasing the supply of physicians in California through: increasing medical school capacity; increasing graduate medical training capacity; incentives to encourage physicians to migrate to the state; and incentives to retain physicians currently practicing in the state;

2. Increasing the productivity and capacity of the existing physician workforce through: expansion of the supply and use of non-physician clinicians; investment in and implementation of new technologies; and increasing the use of treatment protocols and utilization review;

3. Increasing the diversity of the physician workforce;

4. Promoting a more effective environment for physician workforce planning and policies through: increasing data collection and monitoring around physician requirements; developing systems to track physician supply and requirements; undertaking a comprehensive re-assessment of physician supply and requirements every five years; and establishing an overall statewide process for physician workforce planning; and

5. Promoting programs and policies to address physician mal-distribution by region and specialty through: assessment, identification, and publication of shortage areas by specialty; promoting physician loan-repayment and placement programs; providing targeted site development grants; increasing medical education and training in shortage areas; and increasing reimbursement rates in shortage areas.

A discussion of these options is presented at the end of this report.

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OVERVIEW

As part of its recent comprehensive planning efforts around the major health sciences, the University of California Office of the Vice President for Health Affairs contracted with the Center for Health Workforce Studies to assess the adequacy of the physician supply in California over the next decade. The project is an important component of the University's comprehensive review of the size and scope of existing health professions programs; consideration of current and projected health workforce needs; review of state and national data concerning educational opportunities for students; and an assessment of the resources required to meet future needs.

This report detailing the results of the Center's assessment of the physician workforce is organized as follows:

1) Demographic Profile of California with Population Forecasts through 2015

The demographic profile presents data compiled from the U.S. Census Bureau and the California Department of Finance that describes the current population of California and the projected population in 2015. Data are presented at the state, regional, and county level. Additional information is presented on the health status of the population derived from the 2001 California Health Interview Survey. Population developments around the aging of the population, immigration, and racial/ethnic diversity are discussed in terms of how they relate to the future physician requirements in the state.

2) Current Physician Profile of California

The physician profile presents data compiled from the American Medical Association's *Masterfile of Physicians in the U.S.* The profile includes the demographic characteristics (age, gender, race/ethnicity); professional activities (patient care, teaching, research, administration); practice characteristics (specialty, setting, board certification, location of education and training); and county-level and regional distributions of physicians currently located in California. Supplemental data are presented from work conducted by the Center for California Health Workforce Studies. More detailed information by specialty, region, and county has been compiled in a stand-alone profile of physicians in *Physician Supply and Distribution in California, 2002* (Forte et al 2004).

3) California Physician Supply and Demand Forecasts through 2015

In this section of the report, the Center's efforts to forecast physician supply and demand in California over the next decade are presented. In addition, descriptions of the models employed to generate the forecasts are provided. In order to provide a meaningful context to interpret the models and their results, the chapter also includes a broader discussion of the factors affecting physician supply and demand.

4) Options for Promoting a Balance of Physician Supply and Demand in 2015

In this section of the report, the Center suggests a number of options for addressing the likely shortages of physicians in California in the coming years.

BACKGROUND

Nearly 25 years ago, the Graduate Medical Education National Advisory Committee (GMENAC) predicted the nation would possess a relatively large surplus of physicians by the turn of the century. This prediction was made following a 20-year expansion in medical education capacity in the US, where the number of annual medical school graduates more than doubled. After the GMENAC report, allopathic medical schools around the country voluntarily capped the production of new physicians. Osteopathic medical schools, on the other hand, did not limit their production of new physicians, growing by more than 100% between 1980 and 2000. Graduate medical education did not heed GMENAC's warning either. Between 1980 and 1990, the number of residents training in the U.S. increased by close to 50%, from 62,000 to 92,000 residents (Salsberg and Forte 2002).

Concerns about producing too many physicians continued at the national level, and by the mid-1990s, a number of organizations had joined in a call to limit or reduce the number of physicians being produced in the country. The now-famous mantra, "110-50/50", a reference to the national Council on Graduate Medical Education's (COGME) suggested physician production scheme, was first articulated in the Council's Third Report (1993). The "110" referred to the total number of residency training slots available (110% of the medical school graduates in 1993); while the "50/50" referred to the suggested specialty mix of new physicians: 50% primary care and 50% specialty disciplines. In 1994, an influential report suggested that under certain managed care delivery systems, physicians were being used much more sparingly (Weiner 1994). Other recommendations from the American Medical Association, the Association of American Medical Colleges, and the Pew Health Commission reinforced the COGME suggestions. Finally, in 1997, the federal Balanced Budget Act placed a real cap (in the form of economic disincentives to train more than a certain number of physicians) on graduate medical education.

It was not long, however, before the appropriateness of these recommendations was questioned. Consumer and provider backlash against the cost-cutting limitations imposed by managed care halted staff model HMO penetration well shy of its predicted pervasiveness. Anecdotal evidence began to circulate suggesting primary care physicians were having a more difficult time finding satisfactory practice positions than their specialist counterparts. Reports of specialist shortages (particularly anesthesiologists, radiologists, urologists, child and adolescent psychiatrists) also became more common (Schubert et al 2003; Miller and Lanier 2001; Schubert et al 2001; Foot et al 2000; Kim et al 2001; Suneja et al 2001; Neilson et al 2001; Angus et al 2000; Pronovost et al 2002; Sunshine 2001; Organ 2002; Etzoni et al 2003; Fleming et al 2003). The concern raised by the rapid aging of the population played into the questioning as well. Ultimately, in 2002 the COGME commissioned a report to take another look at physician workforce projections. While the report is still being finalized, the findings suggest a substantial physician shortage is likely.

Amid renewed discussion of the adequacy of the physician workforce nationally, several pioneering states have taken it upon themselves to conduct assessments of the adequacy of their supplies of physicians now and with an eye to the future. Arizona, California, Florida, Michigan, New Mexico, Texas, and others have either finished an assessment or are in the midst of one. Arizona, Florida, and Texas have deemed it necessary to expand medical school capacity in their states in order to assure an adequate supply of physicians in the future.

In the spring of 2002, the University of California Office of the Vice President for Health Affairs released a request for proposals to assess the adequacy of the physician workforce in California over the next decade as part of its larger assessment of health professions education (including analysis of workforce needs in the fields of nursing, pharmacy, public health, dentistry, optometry, and veterinary medicine). California had been particularly affected by the work done in the 1980s and 1990s due to its relatively high level of managed care penetration. Moreover, California was one of the only states that responded to the COGME recommendation of a 50% primary care and 50% specialty care mix for newly trained physicians. This occurred through a multi-year Memorandum of Understanding between the University of California and the state indicating that half of the system's residency slots would be set aside for primary care training, defined for this purpose as family physicians, general internists, general pediatricians, and general obsetricians and gynecologists. This agreement, which expired in July 2002, resulted in substantial increases in family practice and other primary care programs, and significant reductions in virtually all other training programs. The Office awarded the Center for Health Workforce Studies a grant to conduct the assessment in the fall of 2002. The report that follows is the sum of the Center's efforts.

DEMOGRAPHIC PROFILE OF CALIFORNIA

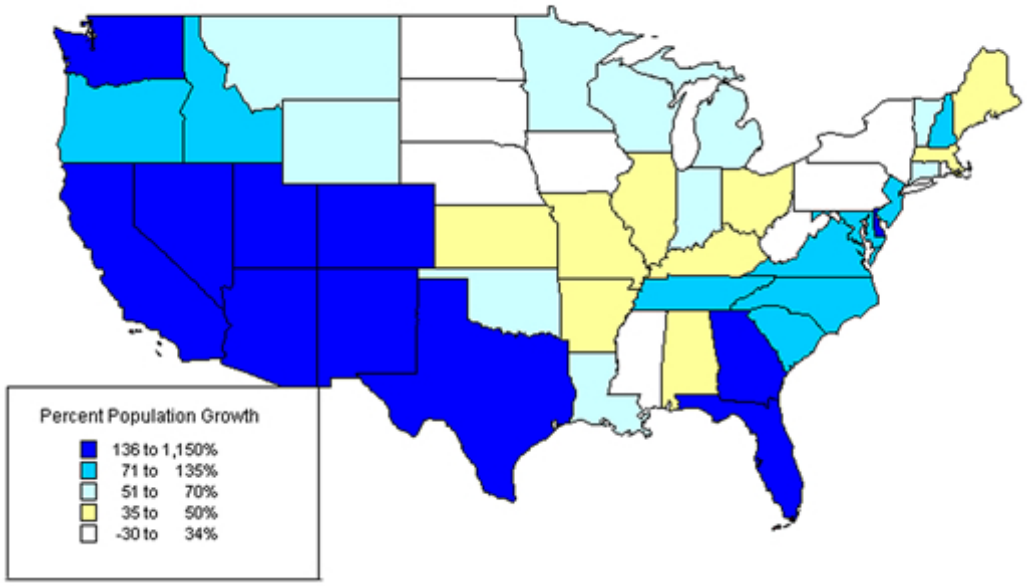
I. National Perspectives

California, with an estimated 34,653,395 residents in 2000, is the most populous state in the United States. Today, at least 12% of Americans (more than one out of every ten) reside in California. California surpasses the population of its nearest rival (Texas) by over 13,000,000 people. California has ranked among the most populous states since at least 1950, when its population of 10,586,223 was exceeded only by that of New York State (at 14,860,192).

Although California has not grown as quickly in either the short-term or long-term as some other states in the Southern and Western "Sunbelt," the population of California has grown by an estimated 220% between 1950 and 2000 (compared to U.S. population growth of about 85%), and an estimated 15.7% between 1990 and 2000 (compared to U.S. population growth of about 13%).

Figure 3-1

Population Growth in the Fifty States, 1950-2000

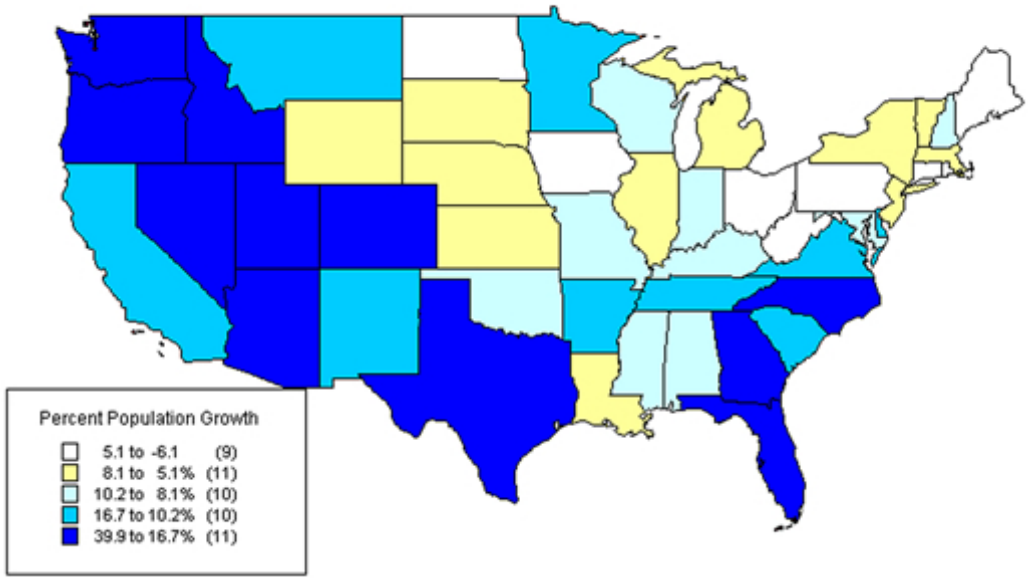


Source: U.S. Census Bureau

California's moderate population growth is expected to continue through the year 2015, with overall growth for the state between 2000 and 2015 at 22.3%. This compares to projected growth of 13.4% for the U.S. during the same period. Certain regions and counties will grow more rapidly than others during this period, and one county (San Francisco) is even expected to experience population loss.

Figure 3-2

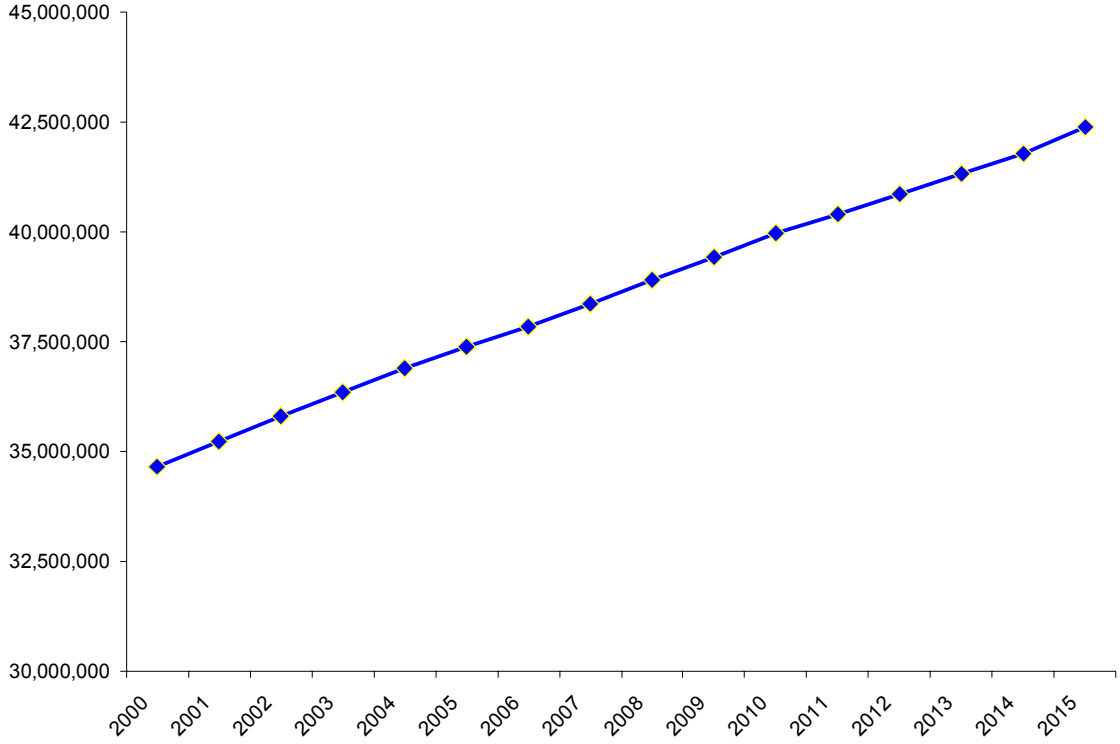
Population Growth in the Fifty States, 1990-2000



Source: U.S. Census Bureau

Figure 3-3

Projected Population Growth in California, 2000-2015



Source: California Department of Finance

II. Population Growth

For the purposes of this report, California's fifty-eight counties are divided into ten regions.[2] Most of these regions consist of multiple counties, although two large counties (Los Angeles and Orange) constitute their own regions.

The Los Angeles region had the largest population in 2000 (about 9,800,000), followed by the Bay Area (about 7,200,000) (Table 3-1). Northern California had the smallest population (about 905,000), followed by the Central Valley/Sierra region (about 1,150,000). The relative ranking of the regions by size is not projected to change by the year 2015. Projected rates of growth, however, vary widely by region (Tables 3-1 and 3-2).

Among the individual counties, the largest in 2000 was Los Angeles County (9,800,000), followed by San Diego County (2,900,000) and Orange County (2,800,000). Forty-five percent of all Californians live in one of these three counties. In contrast, the three smallest counties in 2000 were Alpine County (1,200), Sierra County (3,500), and Modoc County (10,500), which collectively contain less than one-half of one percent of California's population.

All regions of California are expected to grow between 2000 and 2015. The region projected to experience the most growth between 2000 and 2015 is the Inland Empire region (47.3%), followed by the Central Valley/Sierra region (38.5%) and the South Valley/Sierra region (34.9%). The regions projected to experience the least growth by 2015 are the Los Angeles region (11.6% growth), the Bay Area (15.4%), and the Orange County region (15.6%).

Table 3-1

Population Size and Projected Growth by Region, 2000-2015

Region	2000	2015	% Change
Bay Area	7,199,291	8,308,080	15.4%
Central Coast	1,874,448	2,370,148	26.4%
Central Valley/Sierra	1,149,033	1,591,237	38.5%
Inland Empire	3,298,337	4,859,820	47.3%
Los Angeles	9,838,861	10,978,502	11.6%
North Valley/Sierra	2,085,706	2,736,248	31.2%
Northern California	904,963	1,149,853	27.1%
Orange County	2,833,190	3,277,959	15.7%
San Diego	3,097,550	3,900,304	25.9%
South Valley/Sierra	2,372,016	3,198,748	34.9%

Source: California Department of Finance

[2] As defined by the California Primary Care Consortium and the Center for Health Professions, University of California, San Francisco in *California Needs Better Medicine: Physician Supply and Medical Education in California* (1997). See Table A-1 in the Appendix for details on the regional components.

Among the individual counties, rates of projected growth between 2000 and 2015 vary dramatically. The counties projected to experience the greatest population growth during this period are Colusa County (71.4%), Imperial County (65.8%), and Madera County (57.3%). Only one California county is projected to lose population over this period: the population of San Francisco County is expected to decline by 3.9%. Sierra County (one of the smallest) will grow by only 3.4%, and Marin County (adjacent to San Francisco) will grow by only 5.6%. Average growth for all California counties is expected to be about 22.3%.

Table 3-2

California Counties: Population Change 1990-2000 and 2000-2015

	Population 1990	Population 2000	Population 2015	Percent change 1990 to 2000	Percent change 2000 to 2015 (projected)
Alameda	1,284,825	1,470,155	1,717,962	14.4%	16.9%
Contra Costa	807,608	931,946	1,061,222	15.4%	13.9%
Marin	230,155	248,397	262,244	7.9%	5.6%
Napa	111,244	127,084	150,001	14.2%	18.0%
San Francisco	727,873	792,049	760,950	8.8%	-3.9%
San Mateo	651,401	747,061	829,906	14.7%	11.1%
Santa Clara	1,504,402	1,763,252	2,096,376	17.2%	18.9%
Santa Cruz	230,341	260,248	336,826	13.0%	29.4%
Solano	344,116	399,841	514,275	16.2%	28.6%
Sonoma	390,225	459,258	578,318	17.7%	25.9%
Bay Area	***6,282,190***	***7,199,291***	***8,308,080***	***14.6%***	***15.4%***
Monterey	357,364	401,886	521,318	12.5%	29.7%
San Benito	36,970	51,853	74,870	40.3%	44.4%
San Luis Obispo	217,944	254,818	358,482	16.9%	40.7%
Santa Barbara	370,893	412,071	505,627	11.1%	22.7%
Ventura	670,274	753,820	909,851	12.5%	20.7%
Central Coast	***7,935,635***	***9,073,739***	***10,678,228***	***14.3%***	***17.7%***
Alpine	1,142	1,239	1,588	8.5%	28.2%
Calaveras	32,301	42,041	58,424	30.2%	39.0%
Mono	10,034	10,891	13,329	8.5%	22.4%
San Joaquin	483,817	579,712	800,739	19.8%	38.1%
Stanislaus	375,089	459,025	644,148	22.4%	40.3%
Tuolumne	48,647	56,125	73,009	15.4%	30.1%
Central Valley/Sierra	***951,030***	***1,149,033***	***1,591,237***	***20.8%***	***38.5%***
Riverside	1,194,623	1,570,885	2,420,686	31.5%	54.1%
San Bernardino	1,436,696	1,727,452	2,439,134	20.2%	41.2%
Inland Empire	***2,631,319***	***3,298,337***	***4,859,820***	***25.3%***	***47.3%***
Los Angeles	***8,901,987***	***9,838,861***	***10,978,502***	***10.5%***	***11.6%***

	Population 1990	Population 2000	Population 2015	Percent change 1990 to 2000	Percent change 2000 to 2015 (projected)
Amador	30,284	34,853	39,192	15.1%	12.4%
Colusa	16,355	20,973	35,945	28.2%	71.4%
El Dorado	127,396	163,197	236,029	28.1%	44.6%
Nevada	79,107	97,020	128,715	22.6%	32.7%
Placer	174,979	243,646	358,746	39.2%	47.2%
Sacramento	1,049,010	1,212,527	1,538,106	15.6%	26.9%
Sierra	3,318	3,457	3,573	4.2%	3.4%
Sutter	64,967	82,040	108,004	26.3%	31.6%
Yolo	141,504	164,010	208,981	15.9%	27.4%
Yuba	58,776	63,983	78,957	8.9%	23.4%
North Valley/Sierra	***1,745,696***	***2,085,706***	***2,736,248***	***19.5%***	***31.2%***
Butte	183,074	207,158	279,844	13.2%	35.1%
Del Norte	24,135	31,155	39,601	29.1%	27.1%
Glenn	24,856	29,298	43,792	17.9%	49.5%
Humboldt	119,500	128,419	138,201	7.5%	7.6%
Lake	50,932	60,072	84,566	17.9%	40.8%
Lassen	27,645	35,959	46,275	30.1%	28.7%
Mendocino	80,908	90,442	111,731	11.8%	23.5%
Modoc	9,678	10,481	11,919	8.3%	13.7%
Plumas	19,739	20,852	22,695	5.6%	8.8%
Shasta	148,477	175,777	227,189	18.4%	29.2%
Siskiyou	43,531	45,194	51,617	3.8%	14.2%
Tehama	49,851	56,666	77,239	13.7%	36.3%
Trinity	13,021	13,490	15,184	3.6%	12.6%
Northern California	***795,347***	***904,963***	***1,149,853***	***13.8%***	***27.1%***
Orange	***2,417,552***	***2,833,190***	***3,277,959***	***17.2%***	***15.7%***
Imperial	110,749	154,549	256,228	39.5%	65.8%
San Diego	2,511,369	2,943,001	3,644,076	17.2%	23.8%
San Diego	***2,622,118***	***3,097,550***	***3,900,304***	***18.1%***	***25.9%***
Fresno	673,608	811,179	1,024,323	20.4%	26.3%
Inyo	18,277	18,437	19,969	0.9%	8.3%
Kern	549,531	677,372	959,381	23.3%	41.6%
Kings	102,238	126,672	169,452	23.9%	33.8%
Madera	89,349	126,394	198,797	41.5%	57.3%
Mariposa	14,529	16,762	22,077	15.4%	31.7%
Merced	180,182	215,256	289,839	19.5%	34.6%
Tulare	313,999	379,944	514,910	21.0%	35.5%
South Valley/Sierra	***1,941,713***	***2,372,016***	***3,198,748***	***22.2%***	***34.9%***

Source: California Department of Finance

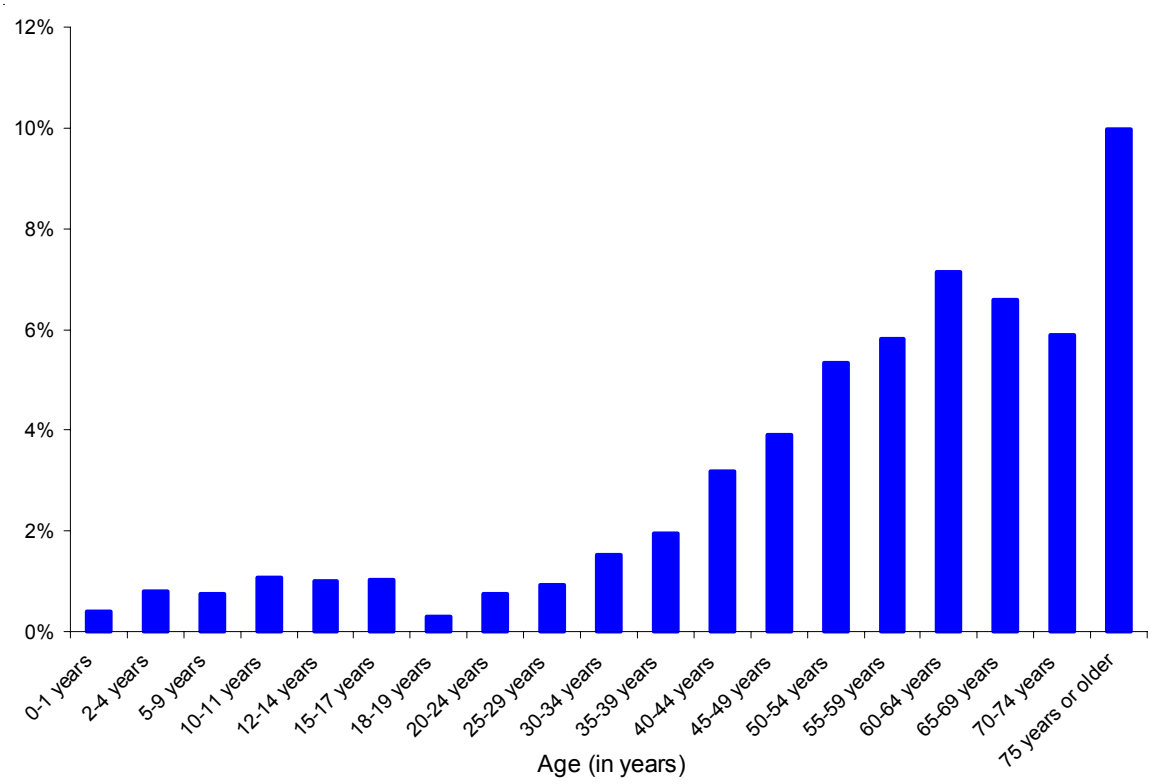
III. The Aging Population

One of the most notable demographic trends projected for the United States as a whole as well as the state of California is the aging of the population. Lower rates of mortality and greater life expectancy have steadily increased both the number and percentage of the population that is age 65 or over since the beginning of the twentieth century. This increase is expected to accelerate dramatically, however, as members of the Baby Boom generation (the large cohort born between 1946 and 1964) begin to turn 65 years of age in 2011.

The consequences of this trend will be especially pronounced for health care. Utilization of health care tends to steadily increase throughout the life course from a low reached approximately between the ages of five and seven. Already, the large cohort of middle-aged Baby Boomers is causing increased demand for health care services. Demand will further increase due to declining health and increasing disability as they reach their senior years.

Figure 3-4

Percentage of Californians Reporting Poor Health by Age, 2001



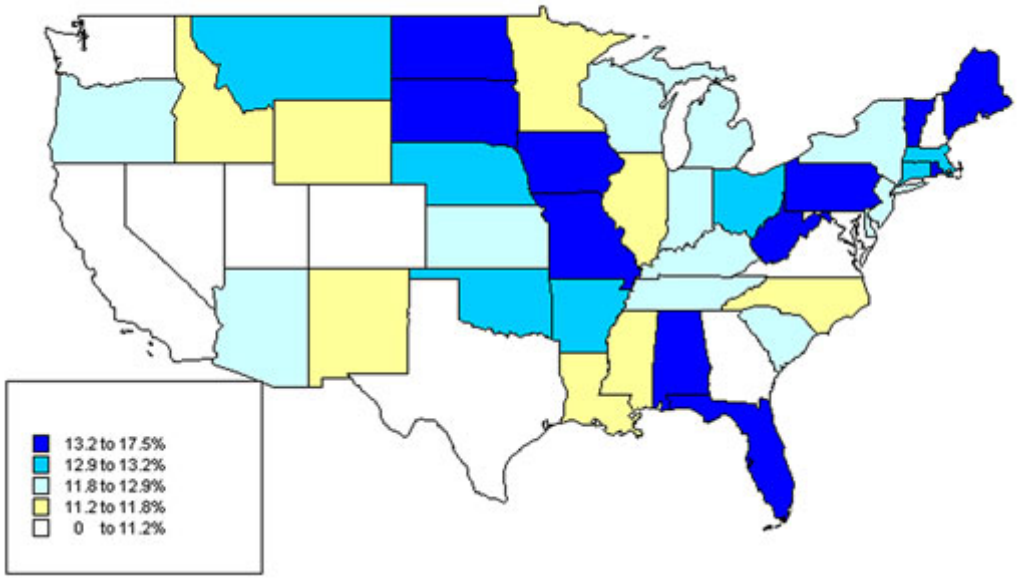
Source: California Health Interview Survey (2001)

One group of older adults that will grow dramatically in the near future is those ages 85 and over. These "oldest old" use the most long-term care services. Age-specific utilization rates for nursing homes have been declining, however, as the overall health and disability status of the elderly continues to improve.

Compared to the United States as a whole, California is one of the "younger" states (see Figure 3-5). In 2000, only 10.3% of California residents were ages 65 and over, compared to 12.1% for the United States overall.

Figure 3-5

Percentage of the Population Age 65 Years and Older in the Fifty States, 2000



Source: U.S. Census Bureau

Aging is not uniform throughout California's regions, however. There is a clear trend toward greater concentrations of elderly people in northern California, and greater concentrations of children in central California (see Figure 3-6). Median age in the Bay Area region and Northern California region is 36, while median ages in the South Valley/Sierra and San Diego regions are only 29 and 31, respectively.

Figure 3-6

Median Age by Region, 2000

Source: California Department of Finance

Overall, the fastest-growing group of Californians between the years 2000 and 2015 will be those ages 65 to 74, who are expected to grow in number by about 58%. They are followed by those ages 85 and older, who are expected to increase by 49%. One group of Californians will actually become smaller: those ages 25 to 44 will decline in size by about 1%.

Other groups are growing more slowly than the California population as a whole. Though the population of California is projected to increase about 22% between 2000 and 2015, the number of children ages 5 to 17 years will increase by less than 15%. Despite an overall trend towards population aging, the number of Californians ages 75 to 84 will increase more slowly than the number of Californians overall (also slightly less than 15%). Those reaching the age of 75 between 2000 and 2015 were born between 1925 and 1940, and were a relatively small birth cohort due to smaller family size during the Roaring Twenties and the Great Depression (U.S. National Center for Health Statistics).

Much regional variation exists, however, in projected growth by age (see Table 3-3). For example, in most regions the number of residents ages 25 to 44 years will either grow more slowly than the overall population or will actually decline. This age group represents those of prime working age, so this trend has tremendous implications for the supply of healthcare workers, including physicians. In particular, the Los Angeles and Orange County regions will experience dramatic population decline in this age group (21% and 19% respectively). In contrast, the Central Valley/Sierra region will experience 31% growth in this age group (similar to the overall growth rate of about 38%), and Northern California will experience 29% growth in this age group (slightly higher than the 27% growth projected for its population overall).

All regions will experience greater growth among the 65 to 74 age group than among the population as a whole, but in some counties this difference is much greater than in others. For example, in the Bay Area, Los Angeles, and Orange County regions, the projected growth of this age group is more than three times the projected growth of the population overall. In other regions, such as San Diego, the disparity in growth rates is smaller (the population overall is projected to grow about 26% while the population of those ages 65 to 74 is expected to grow about 38%). Similar patterns are observed for the population of those ages 85 and over: all regions will experience growth in this group exceeding overall population growth, but this is much more dramatic in some regions than in others.

Table 3-3

Projected Regional Population Change by Age Group, 2000-2015

Region	Under 5 years		5 to 17 years		18 to 24 years		25 to 44 years		45 to 64 years		65 to 74 years		75 to 84 years		85 years and over	
Bay Area	50,593	10.1%	77,352	6.0%	211,745	35.8%	-209,677	-9.0%	606,844	35.6%	284,033	65.4%	44,069	15.3%	43,830	43.4%
Central Coast	51,257	35.7%	73,078	19.9%	76,299	39.2%	47,412	8.0%	154,296	39.2%	67,420	60.7%	13,831	18.5%	12,107	45.6%
Central Valley/ Sierra	42,186	46.1%	69,656	28.4%	47,034	40.2%	99,714	31.0%	120,589	51.2%	43,869	64.4%	8,572	17.7%	10,584	61.8%
Inland Empire	171,470	59.9%	287,739	38.9%	203,819	63.5%	300,621	31.0%	422,589	67.1%	123,593	67.2%	24,937	19.1%	26,715	64.2%
Los Angeles	73,464	8.8%	53,353	2.6%	385,215	46.0%	-653,879	-21.0%	932,480	46.6%	272,458	53.9%	32,722	10.1%	43,828	38.0%
North Valley/ Sierra	54,789	36.0%	90,144	22.0%	74,928	36.1%	109,698	18.0%	200,523	43.3%	82,514	62.7%	17,541	19.8%	20,405	72.4%
Northern California	21,110	37.5%	28,858	17.6%	10,455	11.3%	68,840	29.0%	61,404	29.3%	40,511	57.8%	3,657	6.7%	10,055	55.0%
Orange County	21,137	8.7%	62,244	11.0%	134,235	58.3%	-170,286	-19.0%	260,315	42.5%	96,358	63.0%	26,267	29.8%	14,499	49.7%
San Diego	74,117	29.2%	152,397	25.0%	144,191	41.5%	122,453	12.0%	214,341	40.0%	64,684	37.5%	10,479	8.5%	20,092	48.1%
South Valley/ Sierra	93,008	43.1%	145,438	26.9%	106,311	41.6%	167,857	25.0%	214,939	48.8%	69,264	54.5%	13,172	15.2%	16,743	54.4%
All California	653,131	23.5%	1,040,259	14.9%	1,394,232	43.7%	-117,247	-1.0%	3,188,320	44.1%	1,144,704	58.5%	195,247	15.0%	218,858	48.7%

Source: California Department of Finance

Overall, the greatest percentage growth in the number of those ages 65 and older will occur in the Inland Empire region, although this is also the fastest-growing region of California overall. The second-fastest percentage growth in the number of elderly will occur in the Orange County region, which is one of the slowest growing regions overall.

The San Diego and Los Angeles regions will experience the least percentage growth in the number of elderly, but Los Angeles is the slowest growing region in the state overall. Increases in the number of elderly people in a given region will lead to increased demand for and use of physician services.

IV. Immigration

One of the factors contributing the most to the diversity of demographic trends within California is immigration. California is the state that has the highest percent of residents who are foreign-born: 26% compared to 11% of Americans overall. The number of immigrants will affect the demand for health care, as foreign-born persons use health care differently and have different health care needs than native-born persons (California Health Interview Survey, 2001).

Overall, only about half of Californians were born in the state of California, and less than three-quarters (about 73%) were United States citizens at birth (including those born in the United States, born in U.S. Island Areas, or born abroad to American parents). Of the 26% of Californians not born with U.S. citizenship, only about 40% are naturalized citizens.

Immigrants in California are divided roughly equally between those who entered the U.S. before 1980, those who entered in the 1980s, and those who entered in the 1990s. The likelihood of naturalized citizenship among immigrants increases with the amount of time residing in the United States: more than 68% of those entering before 1980 have become citizens, while only 13% of those entering between 1990 and 2000 have been naturalized.

Table 3-4

Place of Birth of California Residents, 2000

	Frequency	Percent
Total Population	**33,744,503**	**100%**
Native U.S.	*24,710,811*	*72.9%*
Born in California	16,874,782	49.8%
Born in Other State	7,748,578	23.0%
Northeast	*1,629,447*	*4.8%*
Midwest	*2,512,787*	*7.5%*
South	*2,126,272*	*6.3%*
West	*1,435,958*	*4.3%*
Born Outside the U.S.	366,934	1.1%
Puerto Rico	*44,121*	*0.1%*
U.S. Island Areas	*35,310*	*0.1%*
Born abroad of American parents	*287,503*	*0.9%*
Foreign-Born	8,883,376	26.3%
Naturalized citizen	*3,474,092*	*10.3%*
Not a citizen	*5,409,284*	*16.0%*
Foreign-Born	**8,883,376**	**100%**
Year of entry 1990 to 2000:	3,294,536	37.1%
Naturalized citizen	*425,521*	*4.8%*
Not a citizen	*2,869,015*	*32.3%*
Year of entry 1980 to 1989:	2,872,280	32.3%
Naturalized citizen	*1,190,551*	*13.4%*
Not a citizen	*1,681,729*	*18.9%*
Year of entry before 1980:	2,716,560	30.6%
Naturalized citizen	*1,858,020*	*20.9%*
Not a citizen	*858,540*	*9.7%*

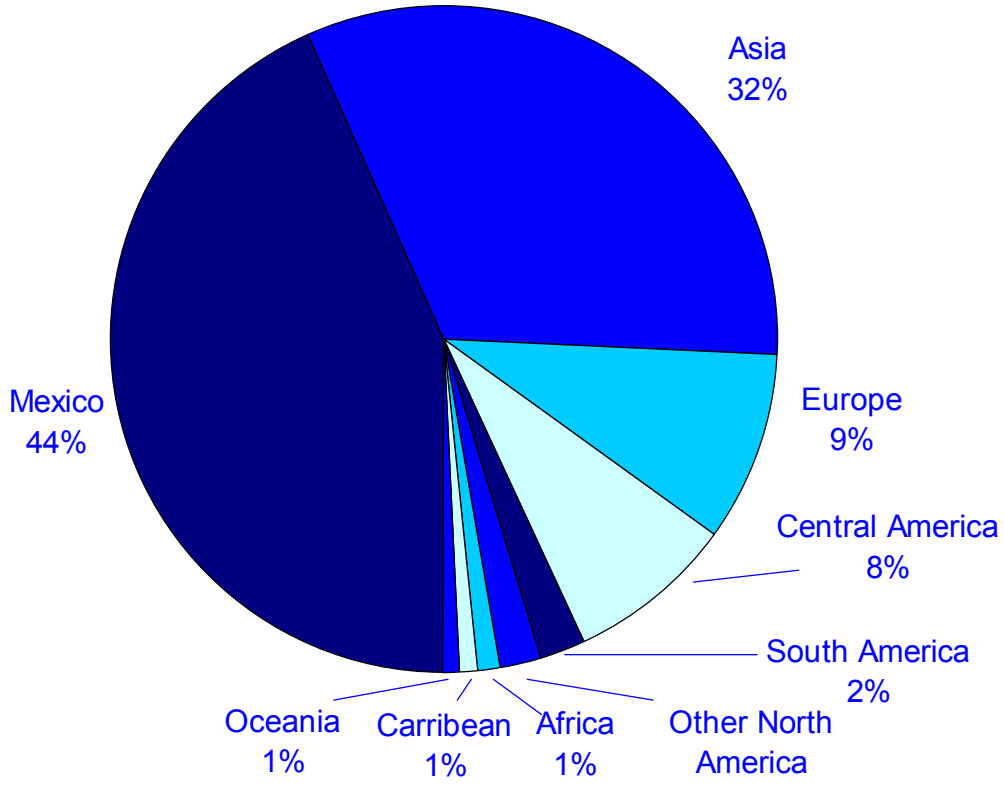
Source: U.S. Census Bureau

Duration of residence is an important variable in determining the health care needs and patterns of foreign-born Californians. Foreign-born Californians, for example, are substantially less likely to have health insurance than native-born Californians (35.6% versus 16.0% without health insurance), but the disparity varies markedly by immigrant cohort. Among those foreign-born Californians who have entered the country in the last ten years, almost a full 50% are without health insurance. By the time foreign-born Californians have been in the United States for thirty years or more, however, rates of uninsurance drop to only about 12%.

A substantial percentage of foreign-born Californians (44%) were born in Mexico. California also receives about one-third (32%) of its immigrants from Asia. Overall, less than a quarter (24%) of immigrants to California were born somewhere other than Mexico or Asia, with 9% born in Europe and 8% in Central America.

Figure 3-7

Birth Place of Foreign-Born California Residents, 2000

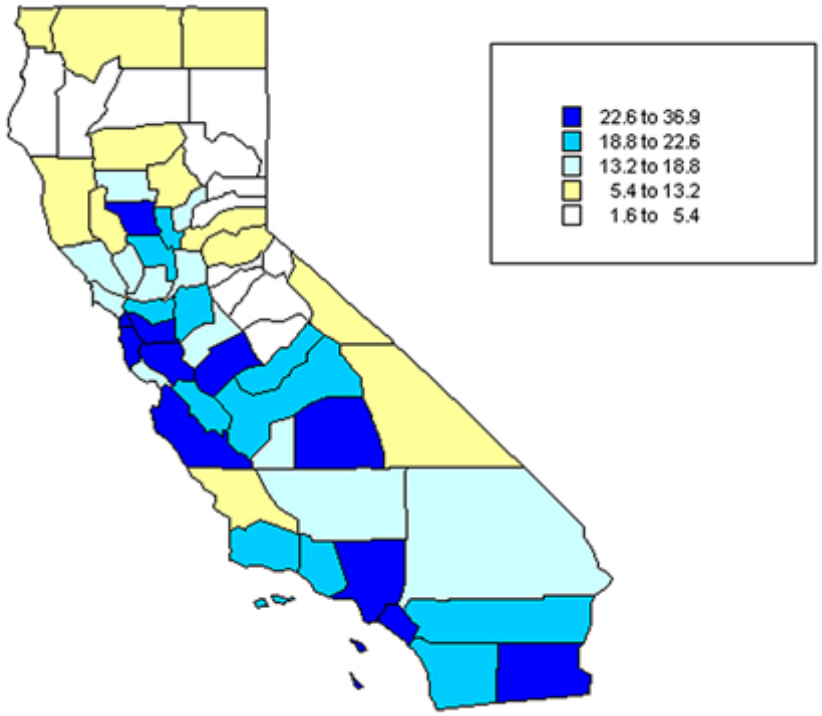


Source: U.S. Census Bureau

The percentage of Californians who are foreign-born varies by region, however (Figure 3-8). Most immigrants are concentrated in the southern and western areas of California (along the U.S.- Mexican border and the Pacific Coast).

Figure 3-8

Percent of Foreign-Born California Residents by County, 2000



Source: U.S. Census Bureau

The percentage of Californians who are foreign-born is projected to continue to rise through the year 2015. As many of the foreign-born residents become long-term residents and assimilate into the U.S. population, the differences between foreign-born and native-born Californians will decrease.

It should be noted that domestic migration is also a significant force shaping the population of California. Almost one out of four Californians was born in another state. Net domestic migration in the early to mid-1990s in California was negative due to the early 1990s recession. Between 1995 and 2000, however, the number of Californians leaving for other states continued to surpass the number of Americans moving to California from other states. Much of this out-migration occurred from the Los Angeles and San Francisco areas. This counter-intuitive trend of negative domestic migration amidst relative economic prosperity in the state demonstrates the powerful effects of the early 1990s recession. This trend recently reversed: from 1999 to 2002, more Americans entered California than left for other states (and net domestic out-migration had been decreasing since 1997 -- a direct result of the economic boom in the late 1990s. Such domestic migration trends have been closely linked to economic conditions (specifically job growth [Levy, 2003]), and future trends may be dependent upon California's economic standing relative to other states.

V. Racial-Ethnic Composition

Unlike many states in which the non-white population largely consists of one particular racial or ethnic

minority, California has substantial numbers of all non-white racial and ethnic groups, making it the most diverse state in the country (only 50% non-Hispanic white in 2000). California has a smaller percentage of African-Americans and Native Americans than the U.S. as a whole, but has a greater percentage of Hispanic/Latino(a)s and Asian/Pacific Islanders. By the year 2015, over half the population of California (50.6%) will be of Hispanic or Asian descent.

Table 3-5

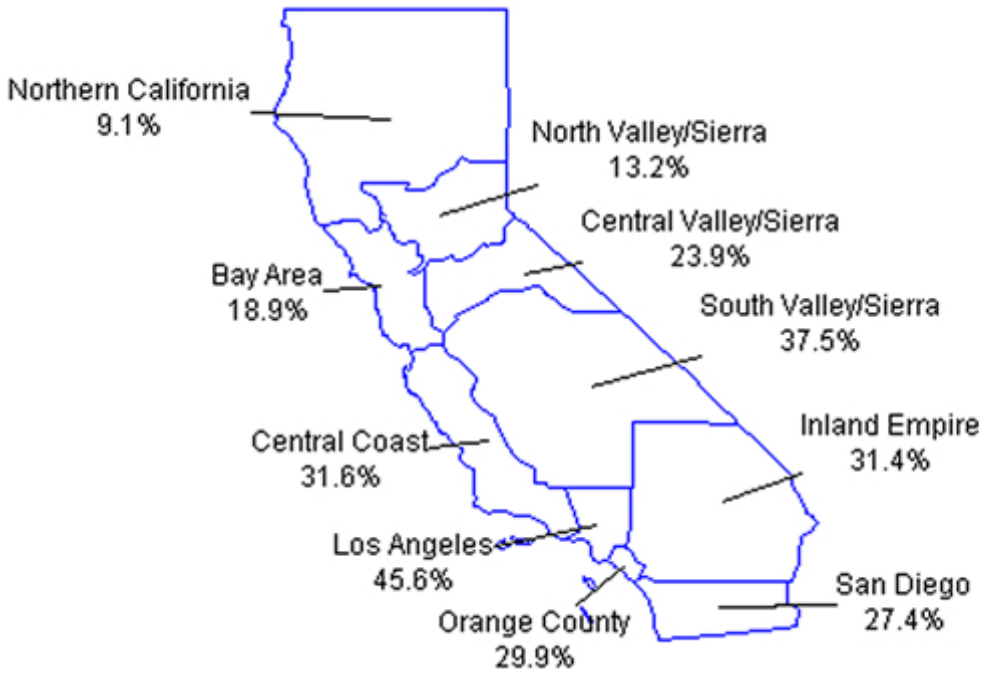
Racial/Ethnic Composition of California and U.S., 1990, 2000, and 2015 (projected)

	California			U.S.		
	1990	2000	2015	1990	2000	2015
White (non-Hispanic)	57.2%	50.3%	42.4%	75.6%	69.1%	65.5%
African American/Black	7.0%	6.7%	6.4%	12.1%	12.3%	13.6%
Asian/Pacific Islander	9.2%	11.5%	13.7%	2.9%	3.7%	5.6%
Native American	0.6%	0.6%	0.6%	0.8%	0.9%	1.0%
Hispanic/Latino	26.0%	30.8%	36.9%	9.0%	12.5%	15.8%

Sources: California Department of Finance; U.S. Census Bureau

Figure 3-9

Percent Hispanic/Latino by Region, 2000

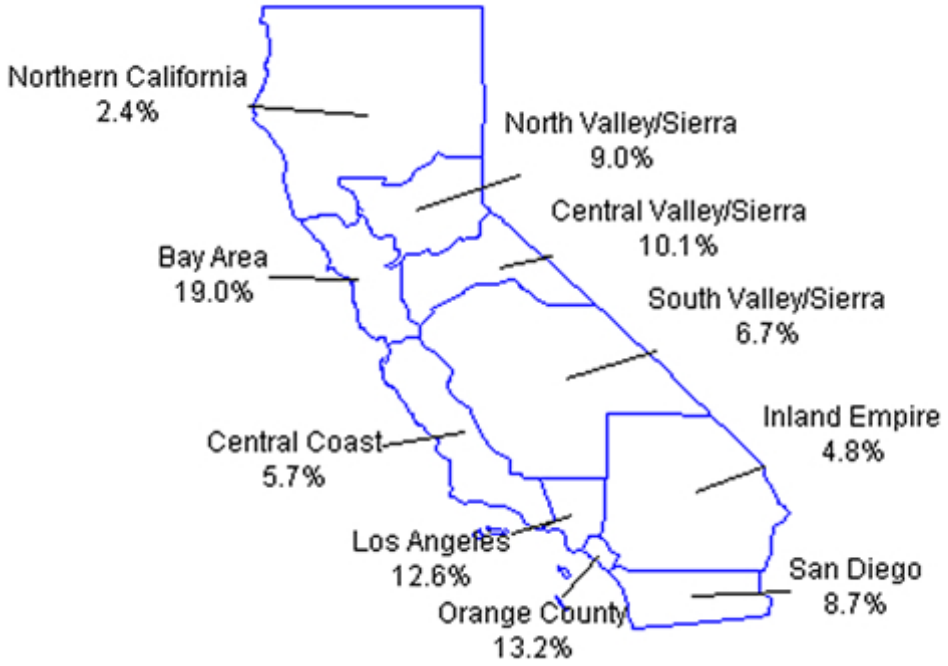


Source: California Department of Finance

There is extreme regional variation in the distribution of racial and ethnic minorities, however. Northern California is the region most heavily non-Hispanic white, at 84%. The Los Angeles region has the lowest concentrations of non-Hispanic whites (about 32% of the population). Hispanic/Latino(a)s are most heavily clustered in Southern California (see Figure 3-9), especially Los Angeles and the South Valley region (46% and 38% respectively). Few Hispanic/Latino(a)s are found in Northern California or the North Valley region.

Figure 3-10

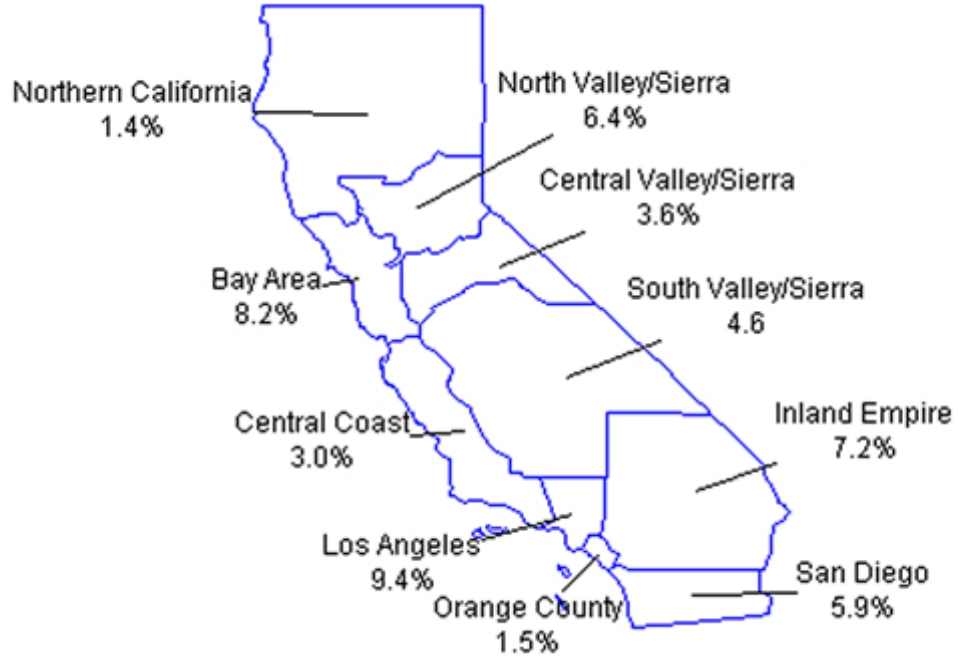
Percent Asian by Region, 2000



Source: California Department of Finance

Figure 3-11

Percent Black by Region, 2000



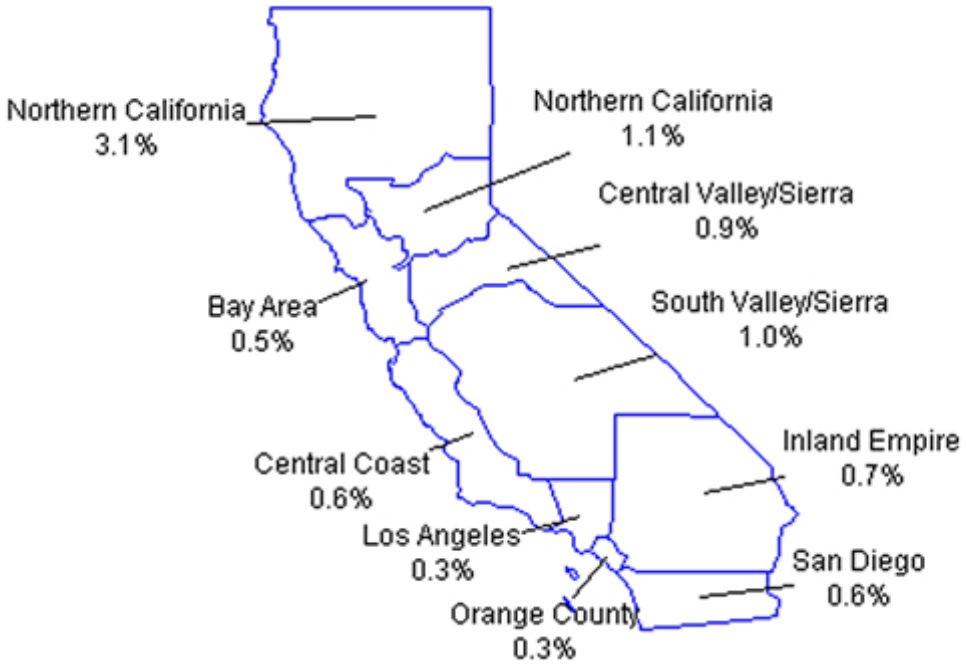
Source: California Department of Finance

Asians, on the other hand, are clustered predominantly in the Bay Area and in Orange County (where they are 19% and 13% of the population). Few Asians are found in Northern California, or in the Inland Empire region (see Figure 3-10).

California has a relatively small percentage of Blacks: less than 7% compared to about 13% for the United States overall. The regions that are most heavily Black are the Los Angeles region (9%) and the Bay Area (8%). In contrast, Northern California and Orange County are each only about 1.5% Black.

Figure 3-12

Percent Native American by Region, 2000



Source: California Department of Finance

Not surprisingly, Native Americans are concentrated in very different areas than other racial or ethnic groups. Nationally, Native Americans are more likely to live in rural areas than any other racial or ethnic minority (U.S. Census), and Native Americans in California follow the same pattern. The highest concentrations of Native Americans are in Northern California, the North Valley, and the South Valley region (3%, 1%, and 1%). Few Native Americans are found anywhere else in California, but they are especially few in the heavily urbanized areas of Los Angeles and Orange Counties (Figure 3-12).

Table 3-6

Projected Population Growth by Race/Ethnicity and Region, 2000-2015

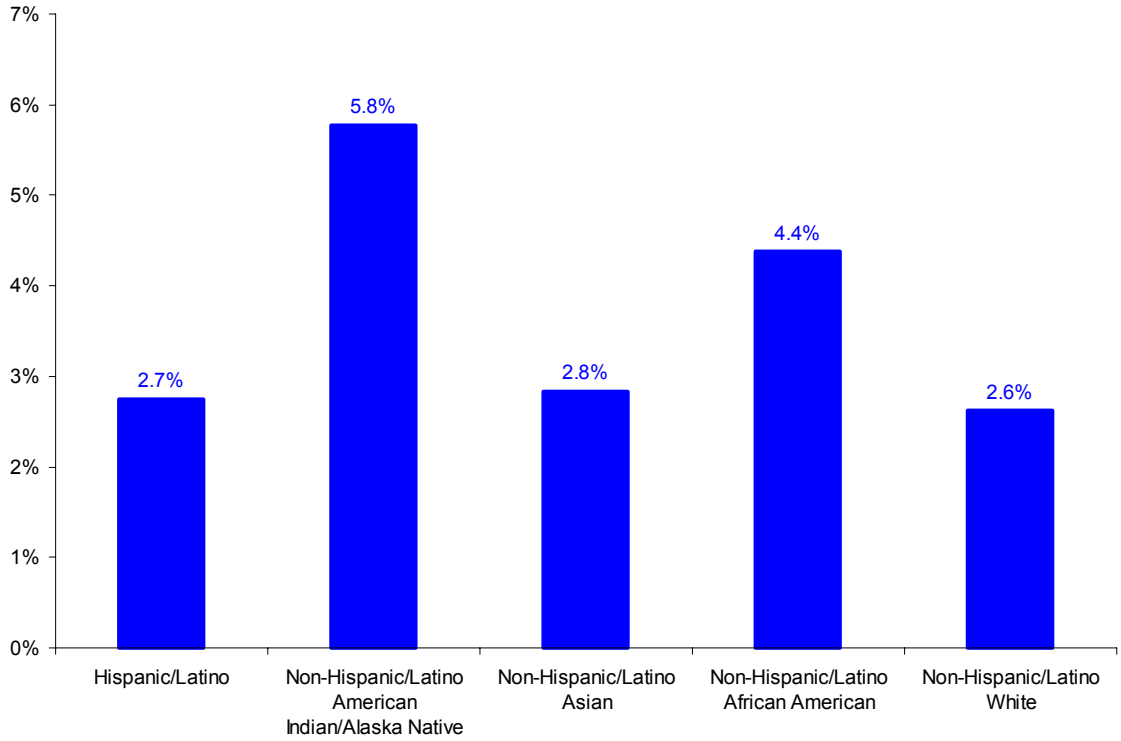
Region	All	White	Hispanic/ Latino	Asian	Black	Native/ Amer
Bay Area	15.4%	-3.7%	40.4%	44.8%	14.6%	9.7%
Central Coast	17.7%	7.6%	59.0%	45.6%	22.3%	16.5%
Central Valley	38.5%	23.5%	63.2%	67.4%	49.0%	34.8%
Inland Empire	47.3%	16.5%	92.2%	105.3%	53.6%	35.9%
Los Angeles	11.6%	-14.6%	30.3%	23.9%	-5.7%	3.3%
North Valley	27.1%	19.5%	58.0%	73.6%	43.8%	36.0%
Northern California	31.2%	20.0%	75.0%	78.5%	39.5%	31.4%
Orange County	15.7%	-7.3%	40.5%	54.9%	21.3%	23.4%
San Diego	25.9%	7.5%	56.9%	54.0%	21.8%	12.6%
South Valley	34.9%	12.0%	58.9%	66.5%	41.8%	32.2%

Source: California Department of Finance

The current geographic distribution of racial and ethnic groups does not correlate, however, with projected growth. The Hispanic/Latino and Asian populations, for example, are projected to increase the most between 2000 and 2015 in the Northern California and Inland Empire regions (regions where they were not heavily represented in 2000). The numbers of Blacks and Native Americans are also projected to increase substantially in the Inland Empire region, where growth of non-non-Hispanic/Latino white populations is projected to be much greater than the growth of the non-Hispanic/Latino white population.

Figure 3-13

Percentage of Californians Self-Reporting Poor Health by Race/Ethnicity, 2001



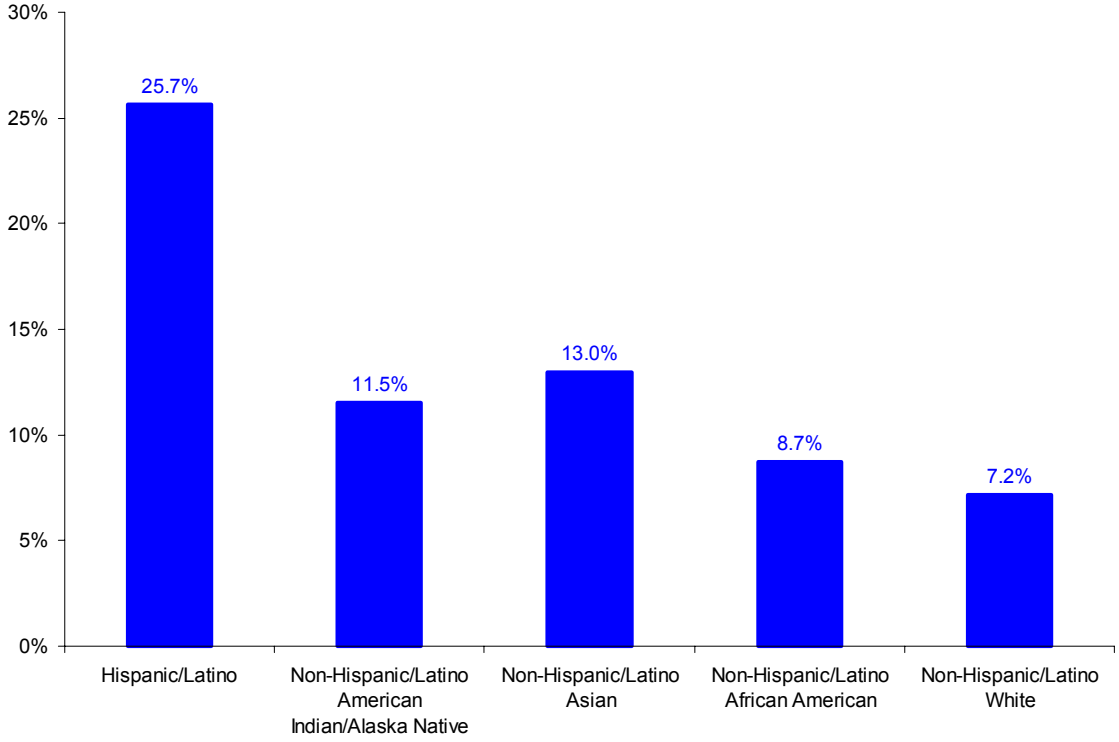
Source: California Health Interview Survey (2001)

The growing number of racial and ethnic minorities in California is a key issue for the provision of health services. As Figure 3-13 demonstrates, Native Americans and African-Americans are much more likely to report being in poor health[3] than whites, Hispanic/Latino(a)s, or Asians. This may indicate a greater unmet need for services in these populations, implying that regions with large and/or growing concentrations of these groups might need to make available more services or more culturally sensitive services.

[3] As part of the *California Health Interview Survey* in 2001, respondents were asked: "In general, would you say your health is excellent, very good, good, fair or poor?"

Figure 3-14

Percentage of Californians Not Currently Insured by Race/Ethnicity, 2001



Source: California Health Interview Survey (2001)

Hispanics/Latino(a)s, on the other hand, are much more likely than other groups to report that they do not currently have health insurance (Figure 3-14). Asians are also slightly more likely than other groups to be uninsured.

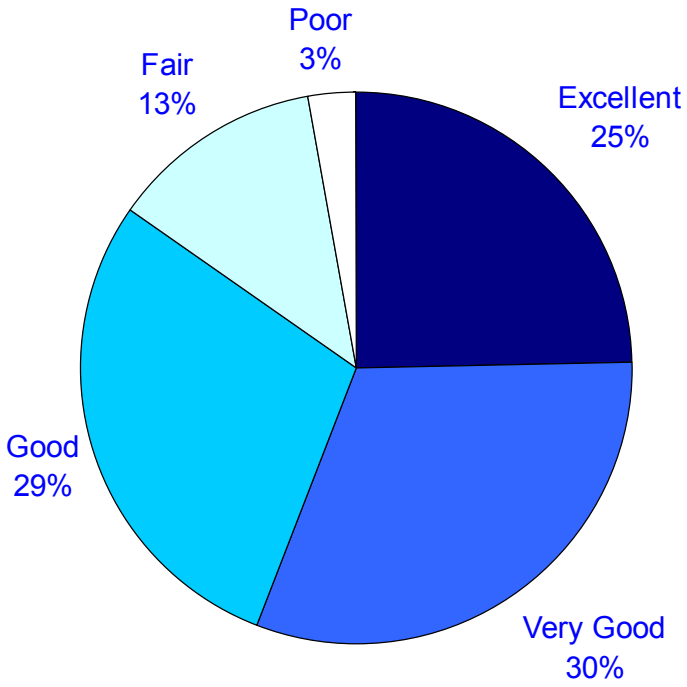
VI. Health Status Indicators

The majority of Californians report themselves to be in either excellent or very good health. Very few report themselves to be in poor health, although the likelihood of such an assessment varies by age and race/ethnicity.

Reports of poor health also vary markedly by region, from a low of 2.1% of the population reporting poor health in the Central Coast region, to a high of 4.4% of the population reporting poor health in the Northern California region. This disparity is due in part to the age distribution of the population, but merits attention because of the implications for planning health services.

Figure 3-15

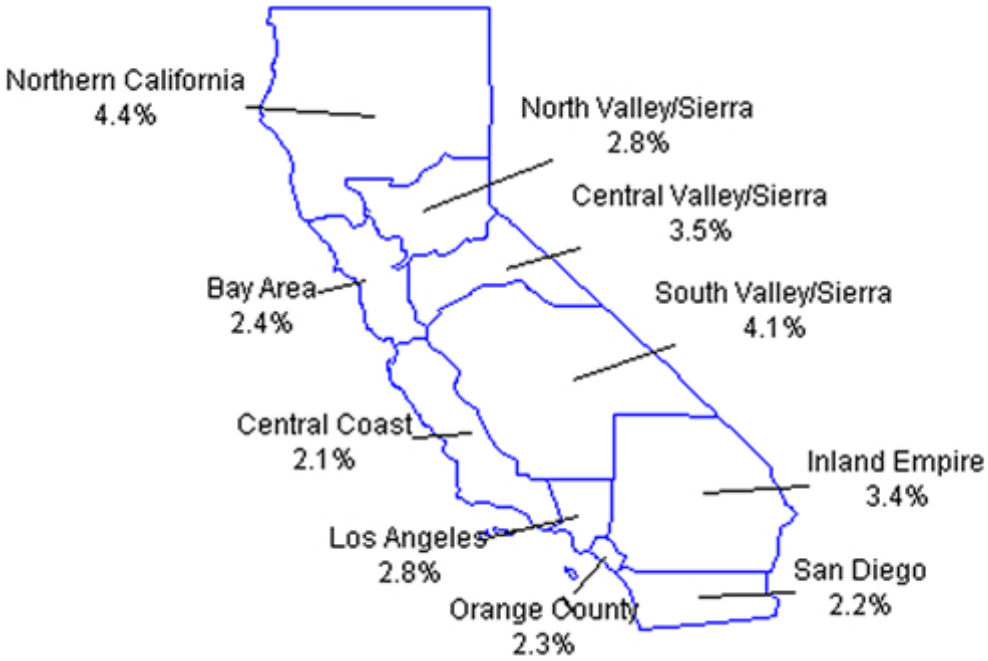
Self-Reported Health Status of Californians, 2001



Source: California Health Interview Survey (2001)

Figure 3-16

Percentage of Californians Reporting Poor Health by Region, 2001



Source: California Health Interview Survey (2001)

Access to health insurance coverage also varies by region. People in the Bay Area and North Valley regions are less likely than others to be uninsured, while those in Los Angeles and the South Valley region are most likely to be without health insurance. This is probably due in large part to the different demographic characteristics in the various regions, but will nonetheless affect health care utilization.

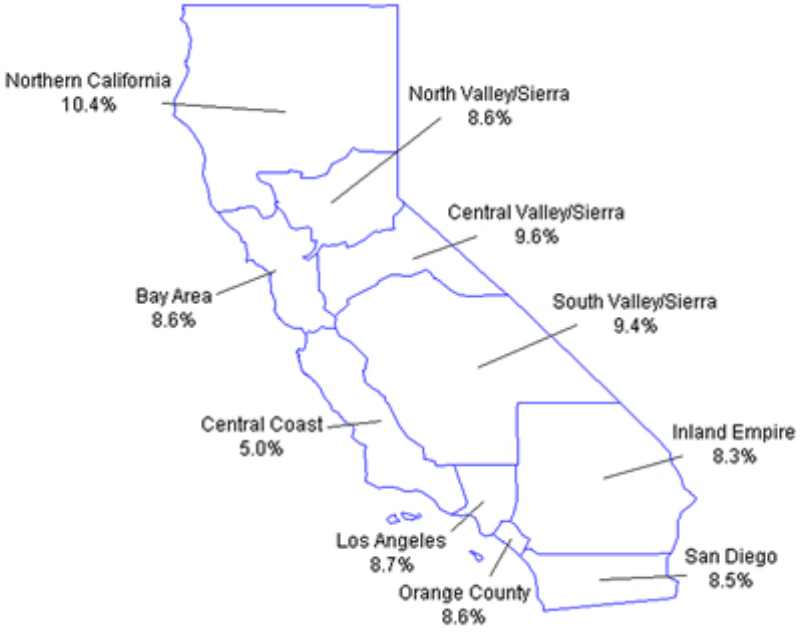
Figure 3-17

Percentage of Californians Lacking Health Insurance by Region, 2001

Source: California Health Interview Survey (2001)

Figure 3-18

Percentage of Californians Seeing a Physician Nine or More Times per Year by Region, 2001



Source: California Health Interview Survey (2001)

Northern California, with the oldest population, is one of the regions with the highest percentage of those seeing a physician nine or more times a year. Such heavy utilization is relatively uncommon among those in the more southern counties.

Figure 3-19

Percentage of Californians Reporting Not Having Not Seen a Physician in the Past Year by Region, 2001

Source: California Health Interview Survey (2001)

Variation by region also exists in terms of the percentage of the population reporting that they have not seen a physician at all in the past year.

CALIFORNIA PHYSICIAN WORKFORCE PROFILE, 2002

I. Introduction

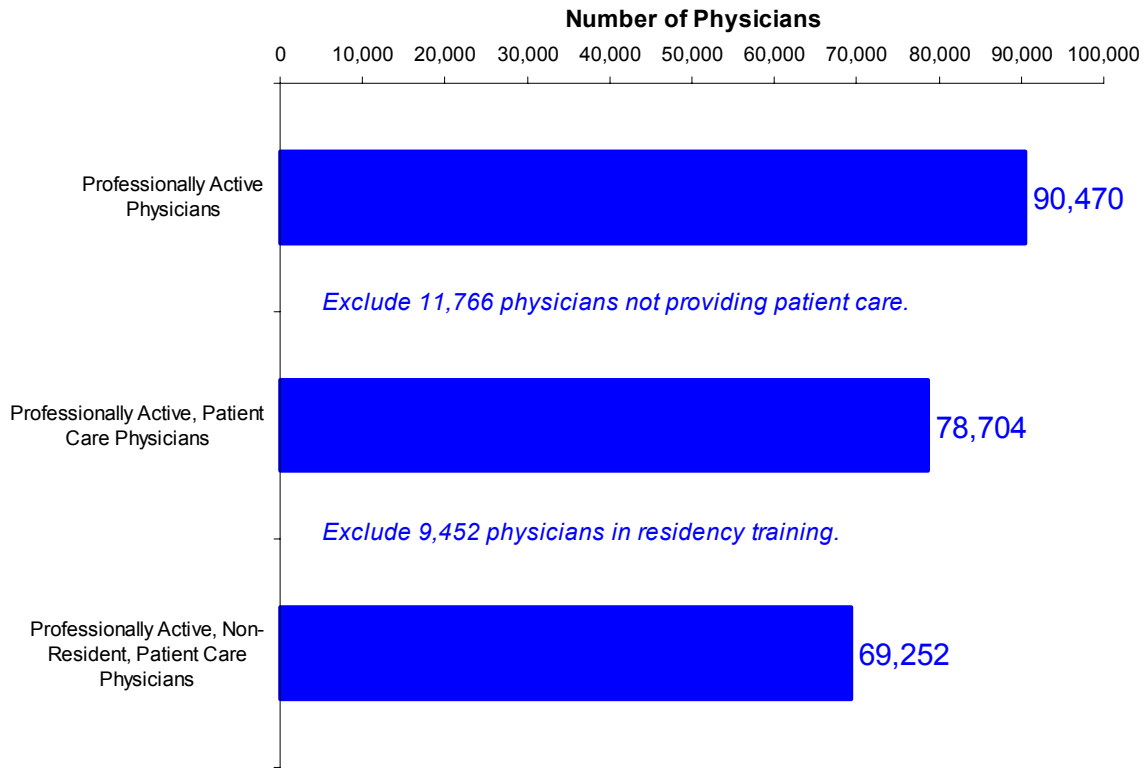
Physicians are central to the delivery of health care to the citizens of California. This chapter provides a variety of quantitative measures on the size, distribution, and characteristics of the physician workforce in California. An effort has been made to present tables and charts that reveal patterns to help readers better understand the dynamics of the physician workforce and to design programs and policies to help improve access to health care in the state.

II. Physician Profile Overview

In 2002, more than 90,000 physicians were active in the state of California. In profiling this population, data are drawn from the American Medical Association (AMA) Physician Masterfile as well as the AMA's Graduate Medical Education Database. Other data sources include recent surveys of physicians practicing in California conducted by the Center for California Health Workforce Studies at the University of California San Francisco.

Figure 4-1

Active Physicians in California, 2002



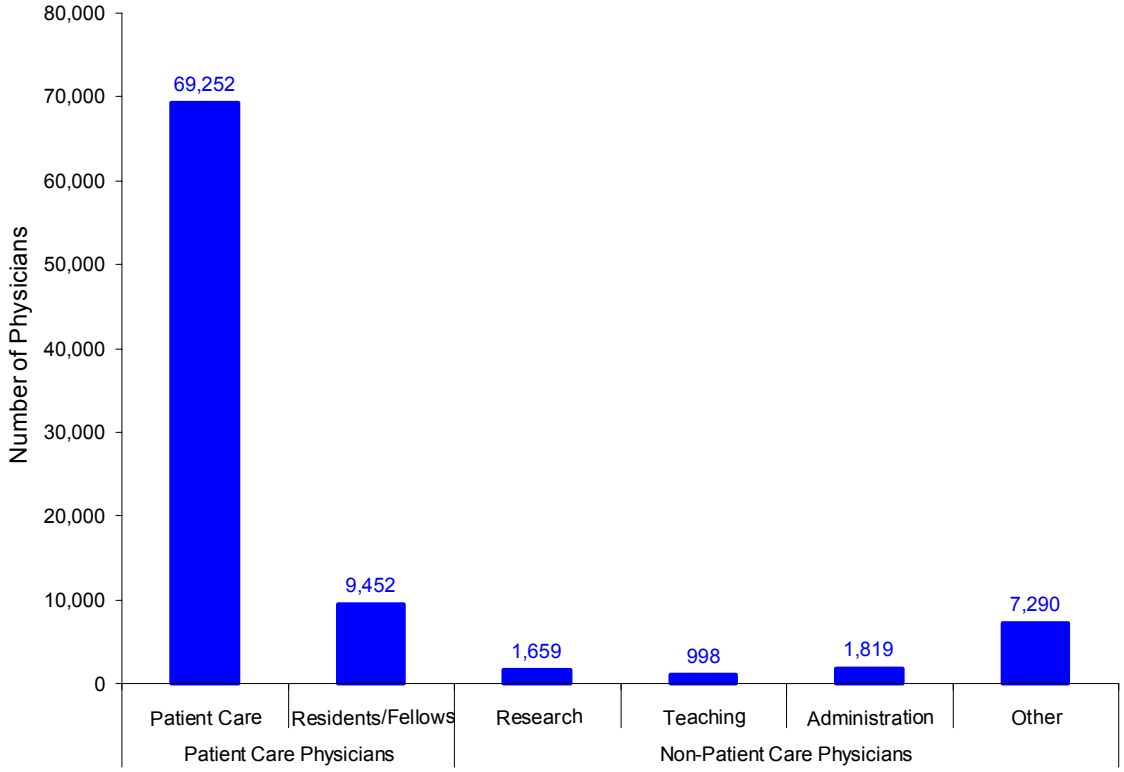
Source: American Medical Association Physician Masterfile, December 2002

In 2002, there were 90,470 professionally active physicians[4] in the state of California. Of these, 69,252 (almost 77%) reported at least some patient care activity. Another 11,766 (13%) were active in the field of medicine, but did not report patient care activity. The remaining 9,452 were still in residency or fellowship training (Figure 4-1).

Figure 4-2 presents estimates of the number of active physicians engaged in patient care and non-patient care activities. The figure shows clearly that patient care occupies the majority of California physicians, while residencies and fellowships (which also typically involve patient care) constitute the second largest activity. Much smaller numbers of physicians are engaged in administration, research, and teaching.

Figure 4-2

Estimated Number of Active Physicians California by Professional Activity, 2002



Source: American Medical Association Physician Masterfile, December 2002

The county with the largest percentage of active physicians was Los Angeles County (29% of all physicians in the state), while two counties (Alpine and Sierra) had no active physicians. Estimated counts for each of the 58 counties in the state are provided in Table 4-1.

The region with the largest percentage of active physicians was Los Angeles (29%). This is followed by the Bay Area, with another 27% of all physicians in the state. The Central Valley and Northern California regions each had only 2% of all the active physicians in the state.

[4] Physicians were considered professionally active if the AMA classified them as not retired/inactive in medicine.

Table 4-1

Estimated Number of Active Physicians in California by County, 2002

County	All Active Physicians Number	All Active Physicians Percent of CA Total	Active Patient Care Number	Active Patient Care Percent of CA Total	Residents/Fellows Number	Residents/Fellows Percent of CA Total	Administration Number	Administration Percent of CA Total	Research Number	Research Percent of CA Total	Teaching Number	Teaching Percent of CA Total
Alameda	3,693	4.6%	3,163	4.6%	370	3.9%	78	4.3%	70	4.2%	27	2.7%
Contra Costa	2,263	2.8%	2,019	2.9%	113	1.2%	56	3.1%	26	1.6%	7	0.7%
Marin	1,347	1.7%	1,145	1.7%	38	0.4%	58	3.2%	40	2.4%	16	1.6%
Napa	400	0.5%	367	0.5%	7	0.1%	14	0.8%	4	0.2%	4	0.4%
San Francisco	4,410	5.4%	3,425	4.9%	1,045	11.1%	120	6.6%	228	13.7%	101	10.1%
San Mateo	2,245	2.8%	1,877	2.7%	266	2.8%	51	2.8%	84	5.1%	21	2.1%
Santa Clara	5,096	6.3%	4,090	5.9%	742	7.9%	106	5.8%	178	10.7%	75	7.5%
Santa Cruz	619	0.8%	573	0.8%	8	0.1%	12	0.7%	8	0.5%	3	0.3%
Solano	647	0.8%	583	0.8%	74	0.8%	5	0.3%	5	0.3%	2	0.2%
Sonoma	1,167	1.4%	1,058	1.5%	38	0.4%	21	1.2%	6	0.4%	12	1.2%
Bay Area	***21,887***	***27.1%***	***18,300***	***26.3%***	***2,701***	***28.7%***	***521***	***28.6%***	***649***	***39.1%***	***268***	***26.9%***
Monterey	733	0.9%	658	1.0%	27	0.3%	23	1.3%	5	0.3%	9	0.9%
San Benito	42	0.1%	42	0.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
San Luis Obispo	644	0.8%	594	0.9%	13	0.1%	18	1.0%	2	0.1%	4	0.4%
Santa Barbara	1,018	1.3%	939	1.4%	54	0.6%	22	1.2%	11	0.7%	4	0.4%
Ventura	1,486	1.8%	1,342	1.9%	92	1.0%	24	1.3%	14	0.8%	9	0.9%
Central Coast	***3,923***	***4.9%***	***3,575***	***5.3%***	***186***	***2.0%***	***87***	***4.8%***	***32***	***1.9%***	***26***	***2.6%***
Alpine	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Calaveras	40	0.0%	33	0.0%	0	0.0%	2	0.1%	0	0.0%	2	0.2%
Mono	23	0.0%	22	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
San Joaquin	845	1.0%	762	1.1%	49	0.5%	11	0.6%	0	0.0%	7	0.7%
Stanislaus	721	0.9%	665	1.0%	31	0.3%	10	0.6%	3	0.2%	4	0.4%
Tuolumne	106	0.1%	96	0.1%	4	0.0%	1	0.1%	0	0.0%	2	0.2%
Central Valley	***1,735***	***2.0%***	***1,578***	***2.2%***	***84***	***0.8%***	***24***	***1.3%***	***3***	***0.2%***	***15***	***1.5%***
Riverside	2,079	2.6%	1,882	2.7%	114	1.2%	42	2.3%	12	0.7%	15	1.5%
San Bernardino	2,745	3.4%	2,316	3.3%	537	5.7%	48	2.6%	22	1.3%	40	4.0%
Inland Empire	***4,824***	***6.0%***	***4,198***	***6.0%***	***651***	***6.9%***	***90***	***5.0%***	***34***	***2.1%***	***55***	***5.5%***
Los Angeles	***23,697***	***29.2%***	***19,778***	***28.6%***	***3,359***	***35.5%***	***527***	***29.0%***	***507***	***30.6%***	***362***	***36.3%***
Amador	61	0.1%	58	0.1%	1	0.0%	2	0.1%	0	0.0%	0	0.0%
Colusa	14	0.0%	12	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
El Dorado	263	0.3%	245	0.4%	4	0.0%	2	0.1%	1	0.1%	1	0.1%
Nevada	221	0.3%	205	0.3%	1	0.0%	6	0.3%	2	0.1%	1	0.1%
Placer	655	0.8%	607	0.9%	18	0.2%	9	0.5%	2	0.1%	3	0.3%
Sacramento	2,844	3.5%	2,452	3.5%	389	4.1%	97	5.3%	32	1.9%	55	5.5%
Sierra	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sutter	180	0.2%	165	0.2%	3	0.0%	1	0.1%	0	0.0%	0	0.0%
Yolo	559	0.7%	449	0.6%	98	1.0%	12	0.7%	28	1.7%	13	1.3%
Yuba	72	0.1%	69	0.1%	0	0.0%	1	0.1%	0	0.0%	0	0.0%
North Valley	***4,869***	***6.0%***	***4,262***	***6.1%***	***514***	***5.3%***	***657***	***36.1%***	***572***	***34.5%***	***435***	***43.6%***

Table 4-1 (cont.)

Estimated Number of Active Physicians in California by County, 2002

	All Active Physicians		Active Patient Care		Residents/Fellows		Administration		Research		Teaching	
	Number	Percent of CA Total	Number	Percent of CA Total	Number	Percent of CA Total	Number	Percent of CA Total	Number	Percent of CA Total	Number	Percent of CA Total
Butte	404	0.5%	385	0.6%	1	0.0%	9	0.5%	0	0.0%	1	0.1%
Del Norte	47	0.1%	46	0.1%	2	0.0%	1	0.1%	0	0.0%	0	0.0%
Glenn	10	0.0%	9	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Humboldt	286	0.4%	274	0.4%	4	0.0%	3	0.2%	1	0.1%	3	0.3%
Lake	80	0.1%	74	0.1%	0	0.0%	0	0.0%	2	0.1%	0	0.0%
Lassen	31	0.0%	27	0.0%	0	0.0%	1	0.1%	0	0.0%	0	0.0%
Mendocino	183	0.2%	171	0.2%	4	0.0%	4	0.2%	2	0.1%	1	0.1%
Modoc	5	0.0%	5	0.0%	1	0.0%	0	0.0%	0	0.0%	0	0.0%
Plumas	30	0.0%	29	0.0%	1	0.0%	0	0.0%	0	0.0%	0	0.0%
Shasta	432	0.5%	391	0.6%	21	0.2%	7	0.4%	2	0.1%	2	0.2%
Siskiyou	71	0.0%	67	0.1%	0	0.0%	1	0.1%	0	0.0%	1	0.1%
Tehama	54	0.1%	51	0.1%	1	0.0%	0	0.0%	1	0.1%	0	0.0%
Trinity	11	0.0%	11	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Northern California	***1,644***	***2.0%***	***1,540***	***2.2%***	***35***	***0.2%***	***26***	***1.4%***	***8***	***0.5%***	***8***	***0.8%***
Orange	***7,656***	***9.4%***	***6,733***	***9.7%***	***757***	***8.0%***	***161***	***8.9%***	***82***	***4.9%***	***74***	***7.4%***
Imperial	117	0.1%	106	0.2%	2	0.0%	3	0.2%	1	0.1%	1	0.1%
San Diego	7,348	9.1%	6,197	8.9%	908	9.6%	190	10.5%	265	16.0%	84	8.4%
San Diego	***7,465***	***9.2%***	***6,303***	***9.1%***	***910***	***9.6%***	***354***	***19.5%***	***348***	***21.0%***	***159***	***15.9%***
Fresno	1,484	1.8%	1,298	1.9%	140	1.5%	36	2.0%	5	0.3%	21	2.1%
Inyo	39	0.0%	35	0.1%	0	0.0%	1	0.1%	1	0.1%	0	0.0%
Kern	920	1.1%	824	1.2%	87	0.9%	17	0.9%	5	0.3%	7	0.7%
Kings	100	0.1%	93	0.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Madera	118	0.1%	113	0.2%	4	0.0%	0	0.0%	0	0.0%	0	0.0%
Mariposa	10	0.0%	9	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Merced	218	0.3%	204	0.3%	21	0.2%	1	0.1%	1	0.1%	2	0.2%
Tulare	429	0.5%	409	0.6%	3	0.0%	5	0.3%	1	0.1%	2	0.2%
South Valley	***3,318***	***3.9%***	***2,985***	***4.4%***	***255***	***2.6%***	***60***	***3.3%***	***13***	***0.8%***	***32***	***3.2%***
Total	**81,018**	**100.0%**	**69,252**	**100.0%**	**9,452**	**100.0%**	**1,819**	**100.0%**	**1,659**	**100.0%**	**998**	**100.0%**

Source: American Medical Association Physician Masterfile, December 2002

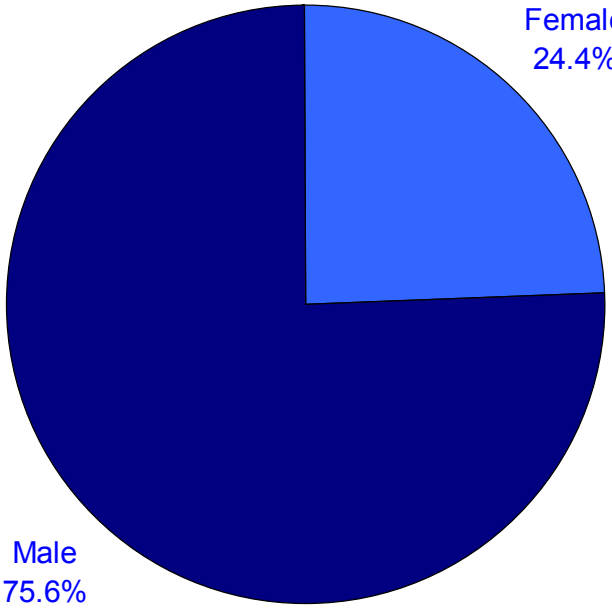
III. Physician Demographics

Physicians in California were predominantly male (76% in 2002), as shown in Figure 4-3. The representation of women varied greatly by specialty. Pediatrics had the largest contingent of women (51%). Primary care specialties and obstetrics/gynecology were among the specialties with the greatest proportion of women. Surgery and its related subspecialties had the smallest representation of women.

Figure 4-4 shows the racial/ethnic composition of California physicians. The majority of physicians (66%) were non-Hispanic white. Asian or Pacific Islander physicians made up the second most numerous group, representing about 22% of physicians. Hispanic/Latino physicians made up only 4.4% of physicians, and Black or African Americans made up only 3%. Physicians reporting another race or ethnicity were 3.8% of the physician workforce, and Native Americans or Alaskan Natives were only 0.1% of the physician workforce.

Figure 4-3

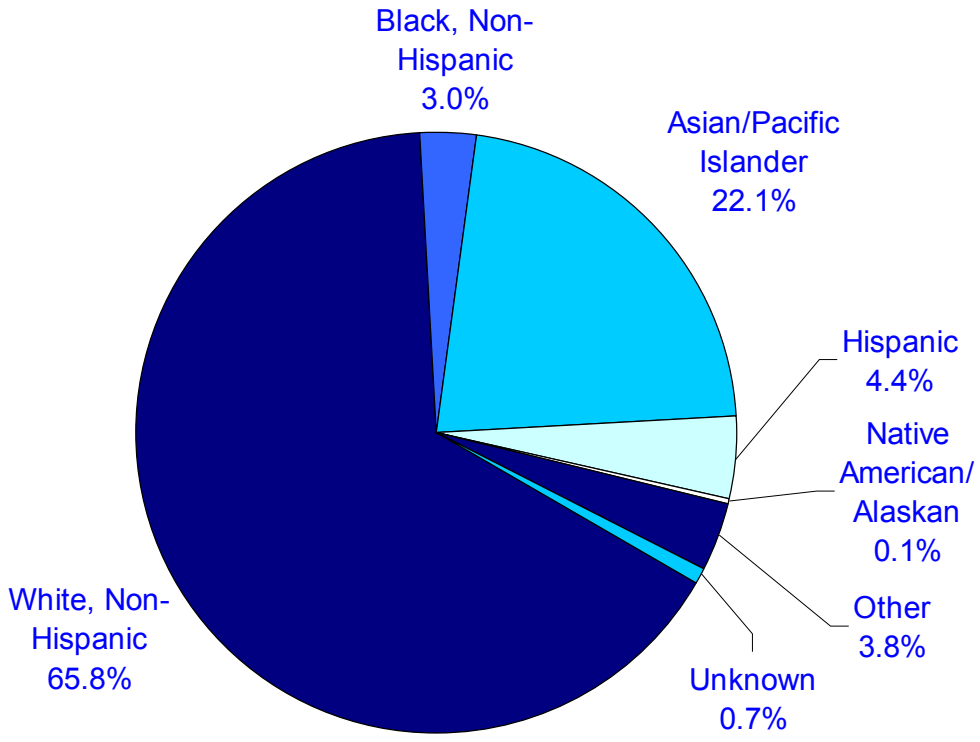
Gender of Active Patient Care Physicians in California, 2002



Source: American Medical Association Physician Masterfile, December 2002

Figure 4-4

Race/Ethnicity of Active Patient Care Physicians in California, 2002



Source: American Medical Association Physician Masterfile, December 2002

Table 4-2

Gender, Race/Ethnicity and IMG Status of Active Patient Care Physicians in California by Specialty, 2002

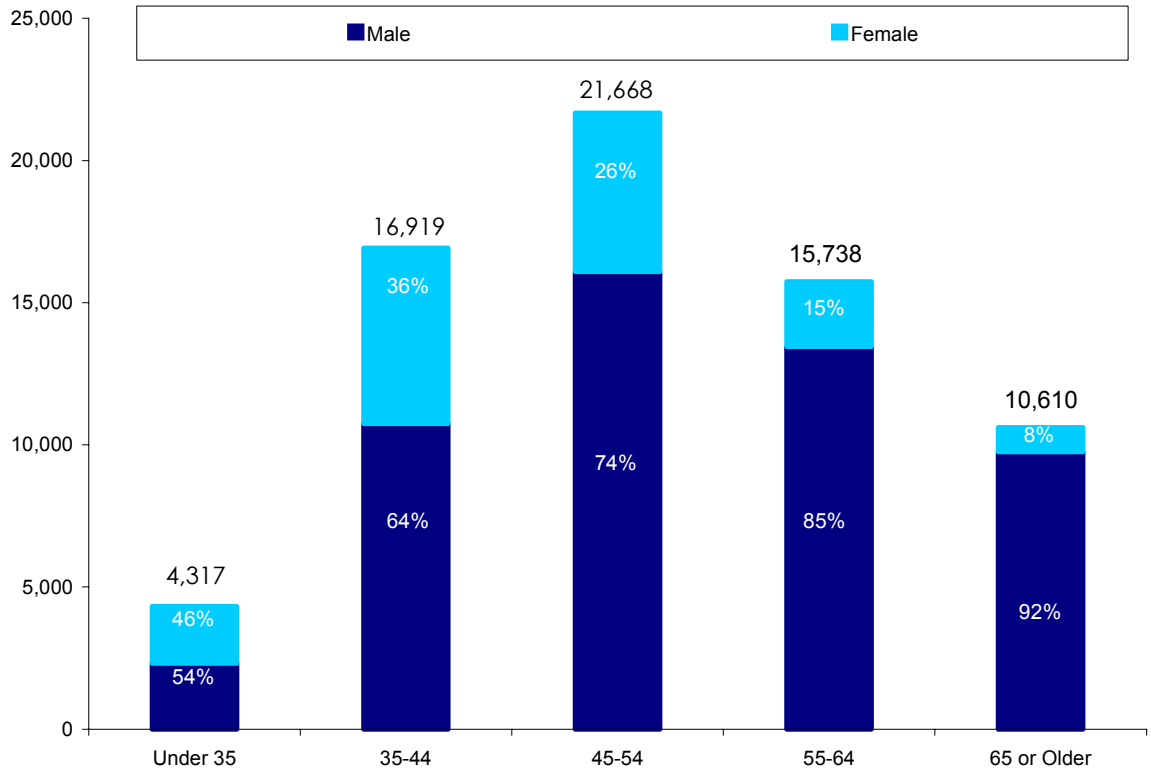
Specialty	Active Patient Care Physicians	Percent Female	Percent Under-Represented Minority	Percent International Medical School Graduate
Family/General Practice	9,864	26.4%	12.1%	22.8%
Internal Medicine (General)	10,020	29.2%	7.4%	29.0%
Pediatrics (General)	5,479	51.3%	9.8%	30.4%
Primary Care	***25,363***	***32.9%***	***9.8%***	***26.9%***
Obstetrics & Gynecology	3,978	34.9%	11.5%	22.1%
Gynecology (Only)	226	24.8%	6.0%	13.7%
Ob/Gyn	***4,204***	***34.3%***	***11.2%***	***21.6%***
Cardiology	1,886	8.1%	4.8%	29.9%
Endocrinology & Metabolism	340	32.1%	4.7%	30.0%
Gastroenterology	993	8.6%	4.9%	28.1%
Geriatrics	163	36.2%	8.5%	36.8%
Infectious Disease	359	29.0%	6.5%	23.1%
Medical Oncology	451	16.9%	4.4%	22.0%
Nephrology	568	16.2%	6.9%	38.7%
Pulmonary Disease	810	11.6%	4.5%	30.0%
Rheumatology	346	23.4%	2.7%	20.2%
Other Internal Medicine	437	23.1%	3.0%	30.4%
IM Specialties	***6,353***	***15.0%***	***4.9%***	***29.2%***
Surgery (General)	***2,325***	***10.1%***	***9.2%***	***23.1%***
Neurosurgery	459	4.1%	6.0%	14.4%
Ophthalmology	2,040	14.8%	4.7%	8.5%
Orthopedics	2,351	3.1%	4.8%	9.6%
Otolaryngology	974	11.0%	5.5%	11.2%
Plastic Surgery	877	8.8%	4.6%	13.2%
Thoracic Surgery	506	3.8%	7.8%	23.3%
Urology	935	3.3%	4.6%	16.7%
Other Surgery Specialties	646	10.2%	5.1%	13.3%
Surgery Specialties	***8,788***	***7.9%***	***5.1%***	***12.0%***
Anesthesiology	4,083	19.5%	6.6%	24.5%
Pathology	1,353	29.6%	4.8%	25.4%
Radiology	3,292	17.7%	4.0%	14.4%
Facility Based	***8,728***	***20.4%***	***5.3%***	***20.8%***
Psychiatry - Adult	4,360	25.4%	6.6%	22.1%
Psychiatry – Child & Adolescent	602	39.2%	7.8%	19.9%
Psychiatry	***4,962***	***27.1%***	***6.8%***	***21.8%***
Allergy & Immunology	421	21.9%	4.9%	24.5%
Dermatology	1,340	33.3%	3.8%	7.0%
Emergency Medicine	2,853	17.2%	7.1%	7.3%
Neurology	1,100	20.6%	4.8%	25.8%
Pediatrics Subspecialties	965	38.0%	8.0%	32.3%
Physical Medicine & Rehab	547	28.7%	5.6%	26.1%
Prev Med/Occ Med/Public Hlth	520	25.6%	10.8%	15.2%
Other	536	20.1%	5.2%	20.3%
Other	***8,282***	***24.4%***	***6.2%***	***16.1%***
Total	***69,005***	***24.4%***	***7.5%***	***22.3%***
Unspecified Specialty	247	31.2%	10.7%	52.2%

Source: American Medical Association Physician Masterfile, December 2002

The representation of under-represented minorities varied considerably by specialty (Table 4-2). Forensic Pathology, Family Practice, General Preventative Medicine, and Obstetrics and Gynecology had the largest proportions of under-represented minorities. Two specialties, Transplant Surgery and Vascular Medicine, had no under-represented minorities.

Figure 4-5

Gender of Active Patient Care Physicians in California by Age, 2002

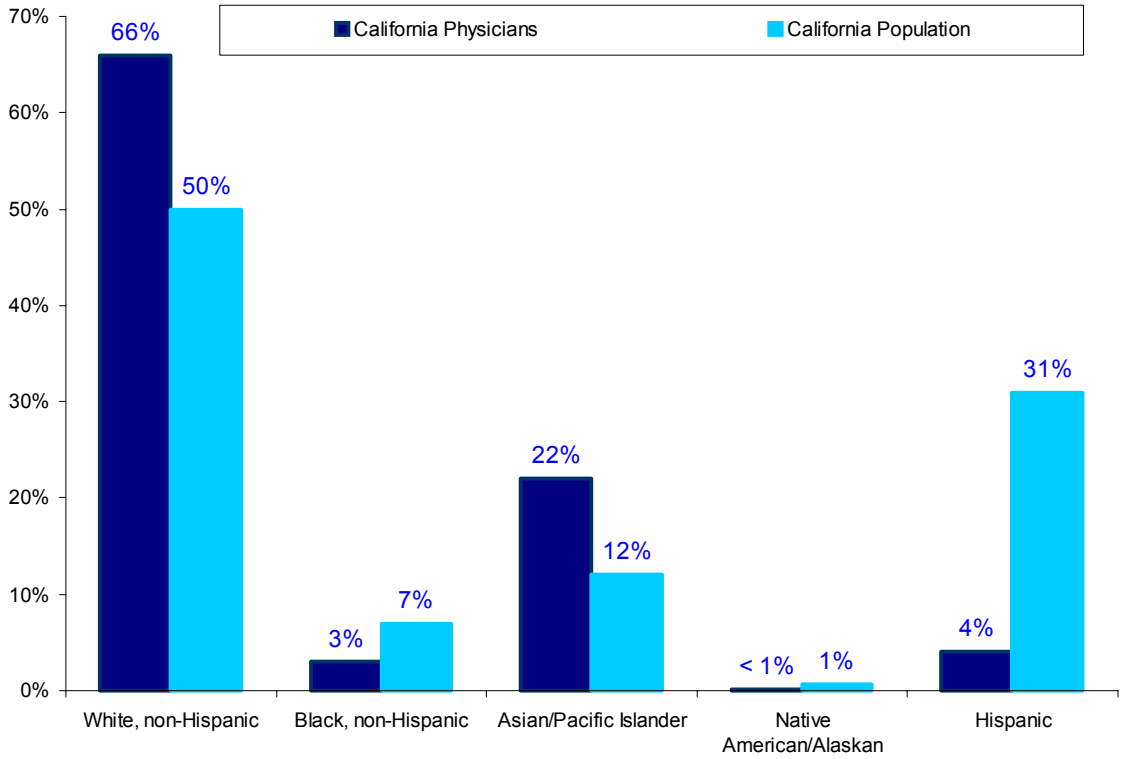


Source: American Medical Association Physician Masterfile, December 2002

Reflecting the growing numbers of women entering the medical profession, women physicians were significantly younger than men in 2002, constituting 46% of physicians under the age of 35, but only 8% of physicians over the age of 65 (Figure 4-5). Overall, the physician workforce is aging, with almost 70% of physicians age 45 or older. Fifteen percent of all physicians are over the age of 65. The median age for all physicians in California is 48, although this varies by gender. Median age for female physicians is only 42, compared to 51 for male physicians.

Figure 4-6

Race/Ethnicity of Active Patient Care Physicians in California Compared to California Population, 2002



Sources: American Medical Association Physician Masterfile, December 2002; California Department of Finance

IV. Medical Education and Residency Training

California imports the vast majority of its physicians from outside the state (about 74% went to medical school elsewhere). The proportion having attended medical school in California was 26% of the total. About 22% of physicians in California were International Medical School Graduates (IMGs) who graduated from a medical school in a foreign country (other than Canada). Of those active patient care physicians who attended medical school in California, almost two-thirds (62%) attended a University of California medical school (Figures 4-7 and 4-9). Almost all of the active patient care physicians in California completed residency training in their principal specialty in the United States, with approximately 57% in California and 40% in another state in the U.S. or Canada (Figure 4-8).

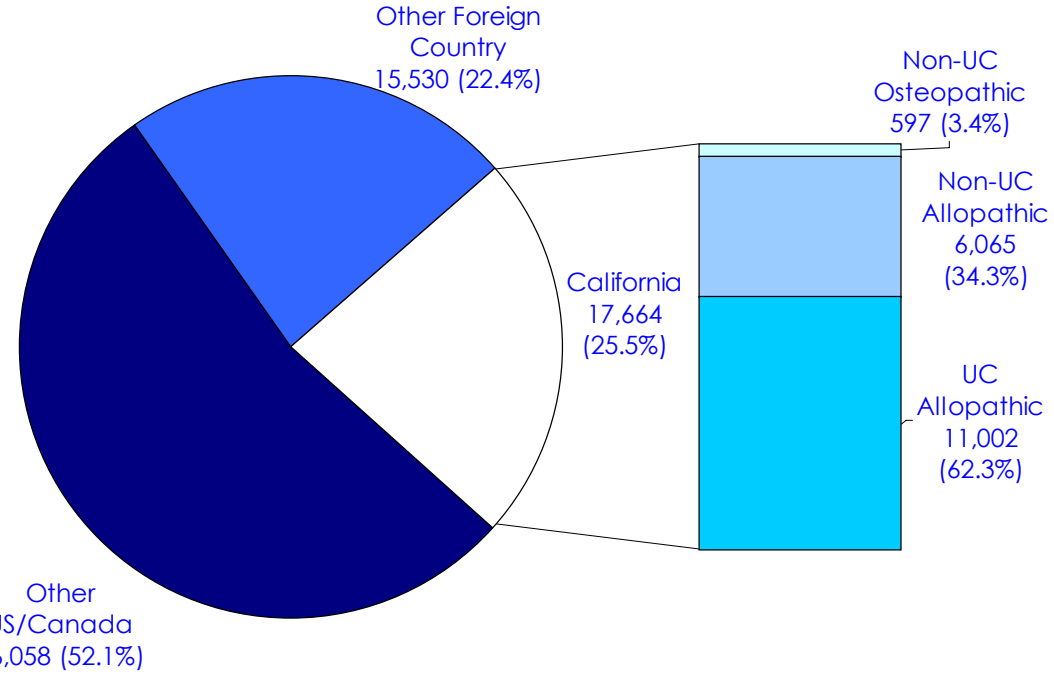
Table 4-3 shows recent trends in medical school graduations at institutions across the state. Of particular note is the very small increases in graduations from allopathic medical schools. For both University of California and non-University of California allopathic medical schools, a very small (6% and 3%, respectively) increase is observed between 1998 and 2002. Going back further to 1992, University of California allopathic medical schools showed no change in the number of medical students enrolled. Thus, the very small increase in graduates (15; 2%) occurred due to an increased number of students taking extended time to complete their studies rather than an increase in enrollment. With a new osteopathic medical school having begun to produce physicians in 2000, almost all of the increases observed in medical school graduations were from non-University of California osteopathic institutions. These institutions have

experienced an 86% increase in graduations since 1998 and a 198% increase since 1992.

Figure 4-10 compares the growth in medical enrollment, population, and medical enrollment per 100,000

Figure 4-7

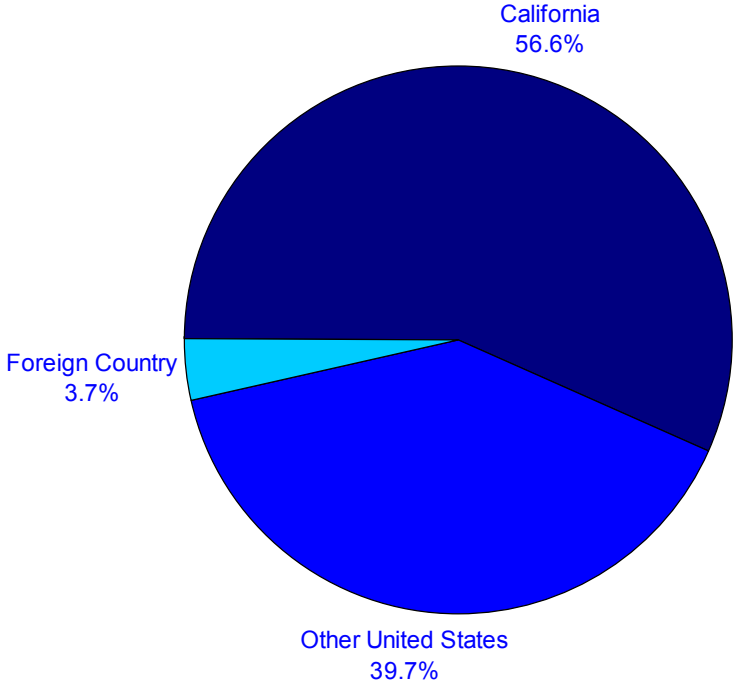
Location of Medical Education of Active Patient Care Physicians in California, 2002



Source: American Medical Association Physician Masterfile, December 2002

Figure 4-8

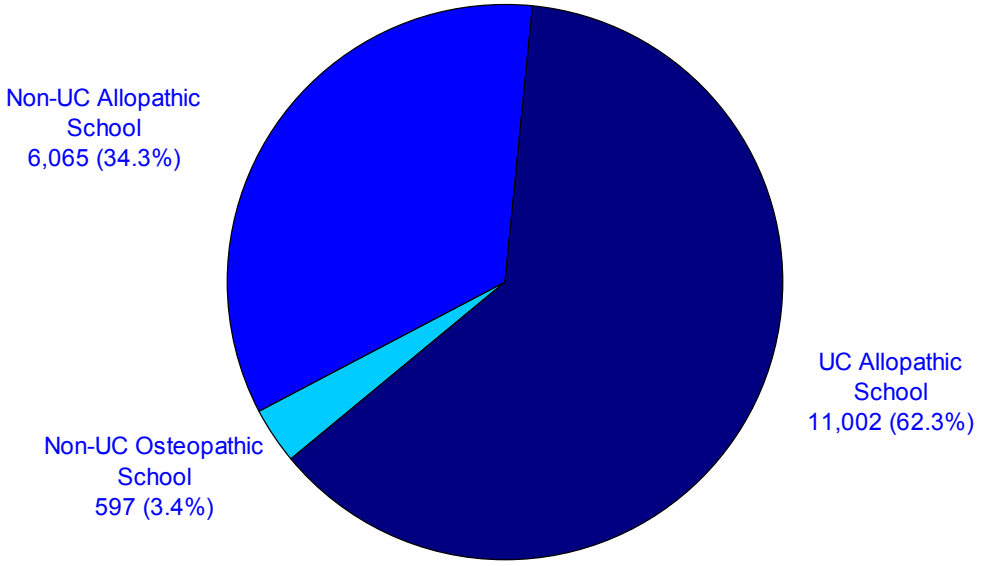
Location of Primary Residency Training of Active Patient Care Physicians in California, 2002



Source: American Medical Association Physician Masterfile, December 2002

Figure 4-9

Location of Medical Education of Active Patient Care Physicians who Attended Medical School in California, 2002



Source: American Medical Association Physician Masterfile, December 2002

Table 4-3

Number of Medical School Graduates by Institution, 1998-2002

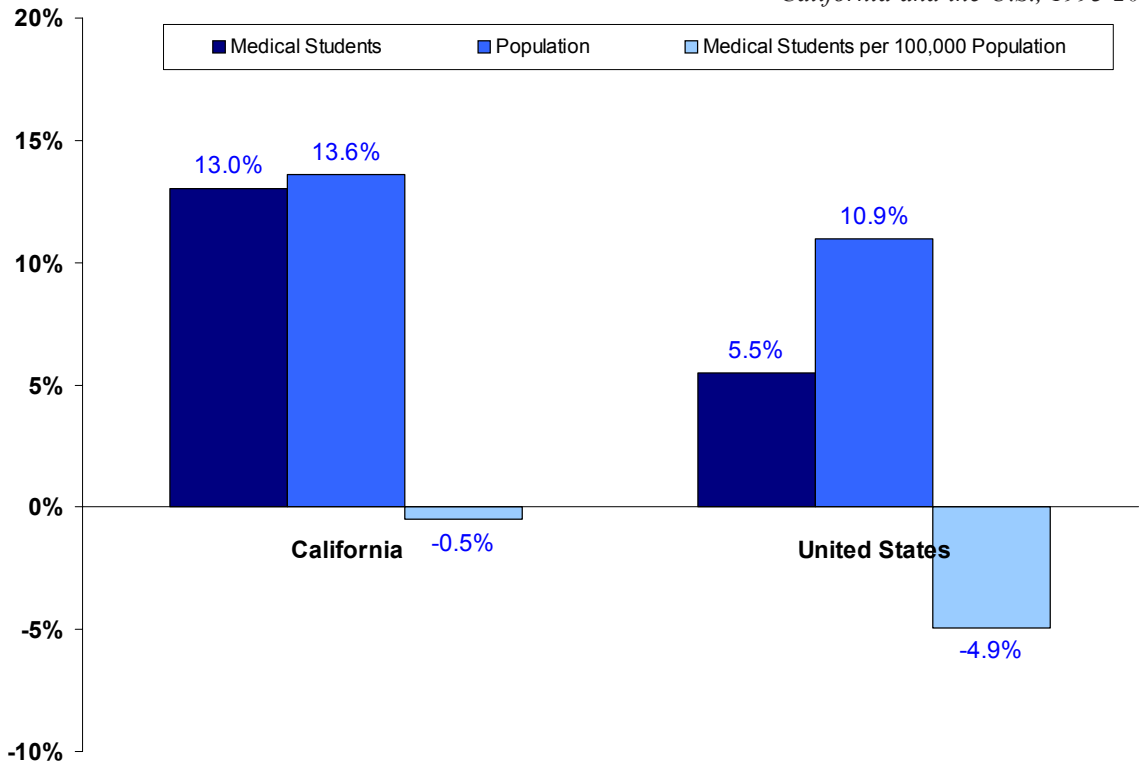
Medical School	1998	1999	2000	2001	2002
Western University of Health Sciences College of Osteopathic Medicine of the Pacific	162	164	168	176	176*
Touro University College of Osteopathic Medicine	--	--	65	125	125*
Osteopathic Medical Schools -- Non-UC	*162*	*164*	*233*	*301*	*301*
Loma Linda University School of Medicine	154	153	168	159	155
Stanford University School of Medicine	85	91	99	85	89
Keck School of Medicine University of Southern California	160	164	159	155	166
Allopathic Medical Schools -- Non-UC	*399*	*408*	*426*	*399*	*410*
Non UC subtotal	*561*	*572*	*659*	*700*	*711*
University of California Davis School of Medicine	95	91	92	90	93
University of California Irvine College of Medicine	88	88	87	97	91
University of California Los Angeles Geffen School of Medicine	164	160	164	155	173
University of California San Diego School of Medicine	108	128	112	98	145
University of California San Francisco School of Medicine	166	143	152	135	155
Allopathic Medical Schools -- UC	*621*	*610*	*607*	*575*	*657*
Total	1,182	1,182	1,266	1,275	1,368

* Estimated

Sources: Journal of the American Medical Association Medical Education Theme Issues, 1999-2003; American Association of Colleges of Osteopathic Medicine

Figure 4-10

Percent Change in Number of Medical School Students, Population and Students per 100,000 Population in California and the U.S., 1993-2002



Sources: Center for Health Workforce Studies; Association of American Medical Colleges; U.S. Census Bureau; California Department of Finance

population between 1992 and 2002 in California and the U.S. While it may appear that California is faring better in terms of medical school enrollment growth keeping pace with population growth relative to the U.S., that conclusion is unwarranted. Because California is so heavily reliant upon physicians educated in other states/countries (74% of the currently active physicians attended medical school outside the state), the fact that medical school enrollment nationwide is not keeping pace with population growth is problematic for the state. It means that California is competing with other "importer" states for an ever-shrinking pool of physicians.

Table 4-4 shows the proportions of physicians who attended medical school in California and those who received residency training in their principal specialty in California by principal specialty. Additionally, there were significant variations in the proportion of IMGs by specialty, with only Nephrology and Geriatrics reporting more than 35%. Few specialties reported fewer than 10% IMGs (those which did include Dermatology, Emergency Medicine, Ophthalmology, and Orthopedics) (Table 4-2).

V. Practice Setting

Table 4-4

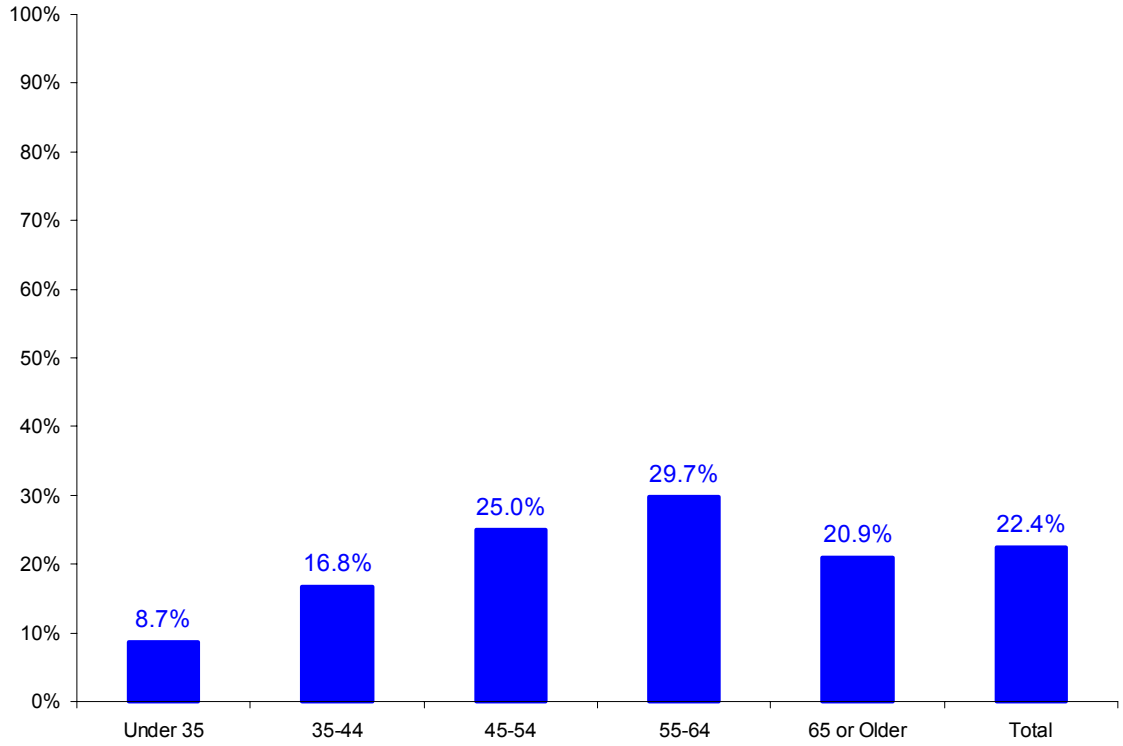
Location of Medical School and Residency Training of Active Patient Care Physicians in California by Specialty, 2002

Specialty	Active Patient Care Physicians	Percent Attended Medical School in CA	Percent Received Specialty Training in CA
Family/General Practice	9,864	33.9%	65.1%
Internal Medicine (General)	10,020	23.7%	61.1%
Pediatrics (General)	5,479	24.1%	63.3%
Primary Care	***25,363***	***27.7%***	***63.1%***
Obstetrics & Gynecology	3,978	26.6%	53.7%
Gynecology (Only)	226	24.8%	56.6%
Ob/Gyn	***4,204***	***26.5%***	***53.9%***
Cardiology	1,886	18.1%	52.0%
Endocrinology & Metabolism	340	18.2%	57.2%
Gastroenterology	993	19.4%	55.1%
Geriatrics	163	24.5%	58.7%
Infectious Disease	359	22.6%	57.6%
Medical Oncology	451	22.4%	50.7%
Nephrology	568	16.2%	51.6%
Pulmonary Disease	810	20.2%	54.2%
Rheumatology	346	22.0%	61.0%
Other Internal Medicine	437	22.9%	60.6%
IM Specialties	***6,353***	***19.7%***	***54.5%***
Surgery (General)	***2,325***	***23.0%***	***52.9%***
Neurosurgery	459	22.0%	42.2%
Ophthalmology	2,040	28.1%	44.7%
Orthopedics	2,351	28.3%	48.0%
Otolaryngology	974	28.1%	53.0%
Plastic Surgery	877	20.2%	39.1%
Thoracic Surgery	506	19.0%	37.6%
Urology	935	24.4%	50.7%
Other Surgery Specialties	646	20.3%	41.0%
Surgery Specialties	***8,788***	***25.6%***	***45.8%***
Anesthesiology	4,083	26.6%	59.8%
Pathology	1,353	22.8%	65.9%
Radiology	3,292	27.1%	63.2%
Facility Based	***8,728***	***26.2%***	***62.0%***
Psychiatry - Adult	4,360	18.9%	64.3%
Psychiatry – Child & Adolescent	602	18.8%	70.8%
Psychiatry	***4,962***	***18.8%***	***65.1%***
Allergy & Immunology	421	18.3%	56.5%
Dermatology	1,340	33.4%	55.0%
Emergency Medicine	2,853	32.9%	67.6%
Neurology	1,100	17.1%	54.7%
Pediatrics Subspecialties	965	19.6%	59.6%
Physical Medicine & Rehab	547	19.4%	53.9%
Prev Med/Occ Med/Public Hlth	520	30.4%	63.0%
Other	***8,282***	***27.0%***	***60.1%***
Total	***69,005***	***25.6%***	***58.8%***
Unspecified Specialty	247		

Source: American Medical Association Physician Masterfile, December 2002

Figure 4-11

Percentage of International Medical School Graduates of Active Patient Care Physicians in California by Age, 2002



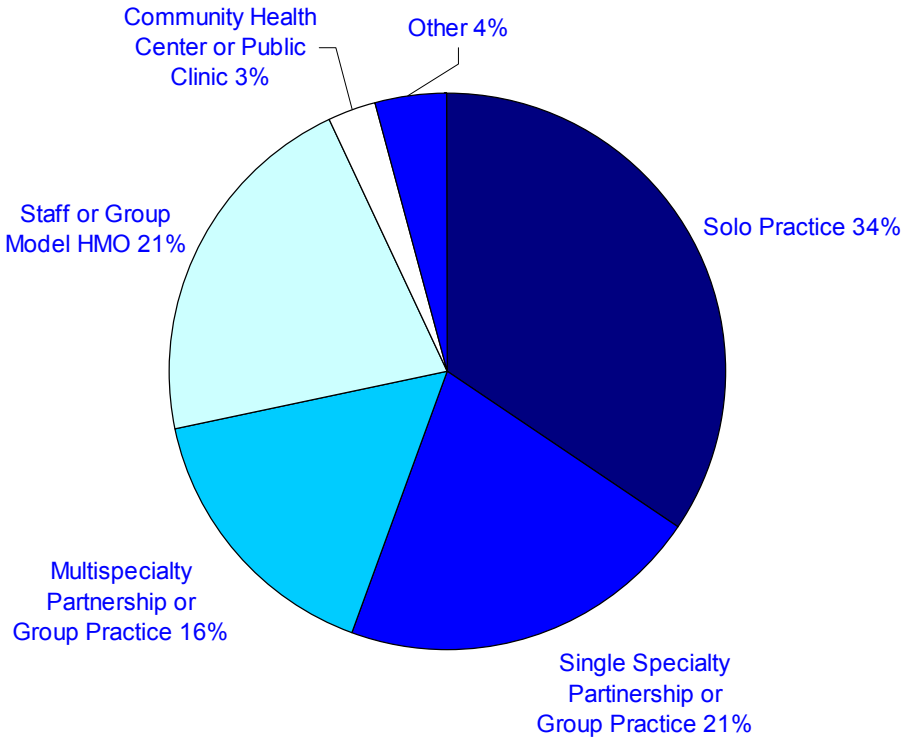
Source: American Medical Association Physician Masterfile, December 2002

Partnerships and group practices were the largest of the principal practice settings of California active patient care physicians in 1998, with 37% of the primary care and 45% of the non-primary care physicians (Figures 4-12 and 4-13). Solo practice (34% and 41%) and staff or group model HMOs (21% and 12%) were the next most frequent practice settings. Very few patient care physicians practiced in community health centers or public clinics.

VI. Practice Specialty

Figure 4-12

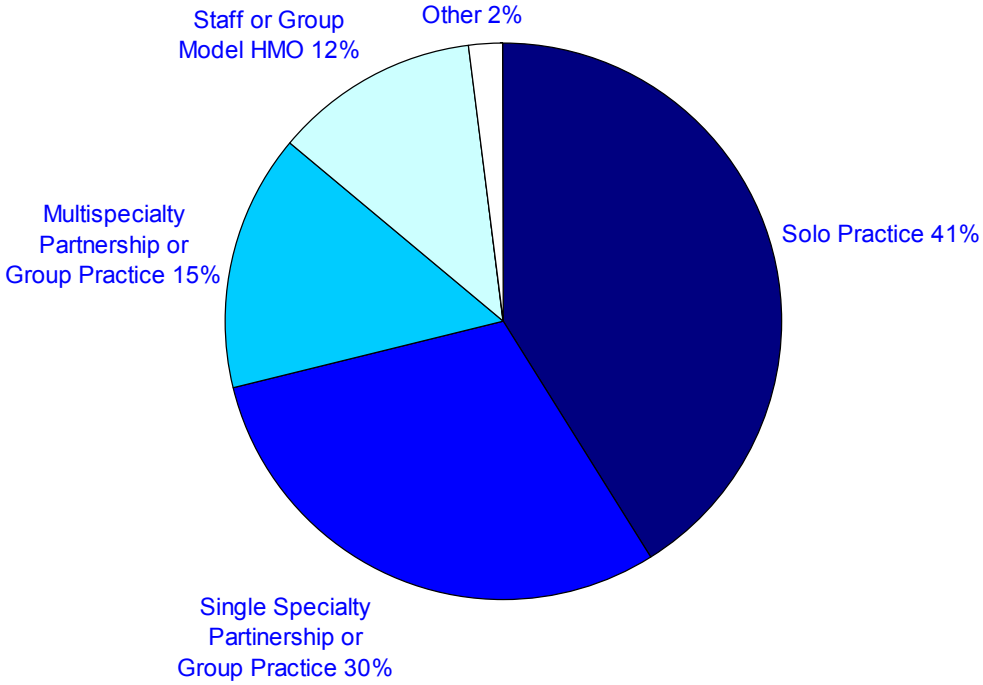
Principal Practice Setting of Active Patient Care Primary Care Physicians in California, 1998



Source: Bindeman et al, 1998

Figure 4-13

Principal Practice Setting of Active Patient Care Non-Primary Care Physicians in California, 1998



Source: Bindeman et al, 1998

Over one-third of the active patient care physicians in California indicated one of the primary care disciplines as their principal specialty. Family Practice, Internal Medicine (General), and Pediatrics (General) were selected by 36.8% of the physicians as their principal specialty. More patient care physicians in California are specialists in general Internal Medicine than any other specialty. Over 10,000 active patient care physicians (14.5% of the total physician supply) indicated that Internal Medicine was their principal specialty. This was followed by Family Practice (14.3%), general Pediatrics (7.9%), and Adult Psychiatry (6.3 %). Table 4-5 presents the estimated numbers and percentages of active patient care physicians in California by specialty.

Over 51,000 physicians in California (almost 75%) reported that they were certified by the American Board of Medical Specialties in their principal specialty (Table 4-5). This figure varied substantially across specialties, from less than 52% in Geriatrics to almost 93% in Radiology.

VII. Potential Shortage Areas

Table 4-5

Principal Specialties of Active Patient Care Physicians in California, 2002

Specialty	Active Patient Care Physicians	Percent of Active Patient Care Physicians in CA	Percent Board Certified
Family/General Practice	9,864	14.3%	62.0%
Internal Medicine (General)	10,020	14.5%	79.1%
Pediatrics (General)	5,479	7.9%	84.9%
Primary Care	***25,363***	***36.8%***	***73.7%***
Obstetrics & Gynecology	3,978	5.8%	81.7%
Gynecology (Only)	226	0.3%	80.1%
Ob/Gyn	***4,204***	***6.1%***	***81.6%***
Cardiology	1,886	2.7%	79.3%
Endocrinology & Metabolism	340	0.5%	72.1%
Gastroenterology	993	1.4%	82.2%
Geriatrics	163	0.2%	51.5%
Infectious Disease	359	0.5%	70.8%
Medical Oncology	451	0.7%	79.8%
Nephrology	568	0.8%	73.4%
Pulmonary Disease	810	1.2%	83.1%
Rheumatology	346	0.5%	79.5%
Other Internal Medicine	437	0.6%	42.1%
IM Specialties	***6,353***	***9.2%***	***75.6%***
Surgery (General)	***2,325***	***3.4%***	***75.6%***
Neurosurgery	459	0.7%	79.5%
Ophthalmology	2,040	3.0%	89.8%
Orthopedics	2,351	3.4%	88.2%
Otolaryngology	974	1.4%	86.3%
Plastic Surgery	877	1.3%	75.4%
Thoracic Surgery	506	0.7%	79.2%
Urology	935	1.4%	88.3%
Other Surgery Specialties	646	0.9%	31.4%
Surgery Specialties	***8,788***	***12.7%***	***81.9%***

Table 4-5 (cont)

Principal Specialties of Active Patient Care Physicians in California, 2002

Specialty	Active Patient Care Physicians	Percent of Active Patient Care Physicians in CA	Percent Board Certified
Anesthesiology	4,083	5.9%	77.3%
Pathology	1,353	2.0%	89.9%
Radiology	3,292	4.8%	92.9%
Facility Based	***8,728***	***12.6%***	***85.2%***
Psychiatry - Adult	4,360	6.3%	65.8%
Psychiatry – Child & Adolescent	602	0.9%	44.5%
Psychiatry	***4,962***	***7.2%***	***63.2%***
Allergy & Immunology	421	0.6%	75.8%
Dermatology	1,340	1.9%	87.8%
Emergency Medicine	2,853	4.1%	76.6%
Neurology	1,100	1.6%	79.6%
Pediatrics Subspecialties	965	1.4%	67.6%
Physical Medicine & Rehab	547	0.8%	79.5%
Prev Med/Occ Med/Public Hlth	520	0.8%	43.8%
Other	536	0.8%	7.1%
Other	***8,282***	***12.0%***	***71.4%***
Total	***69,005***	***100.0%***	***75.6%***
Unspecified Specialty	247		

Source: American Medical Association Physician Masterfile, December 2002

The Inland Empire and South Valley regions had the lowest number of active patient care physicians per 100,000 population (both at 120 per 100,000). This is particularly noteworthy because these two regions are among the regions projected to experience the most dramatic population growth between 2000 and 2015. The Bay Area had the highest number of active patient care physicians per 100,000 population (247 per 100,000), and this is one of the regions projected to grow the least during this period.

In the mid 1990s, the Council on Graduate Medical Education developed physician supply recommendations. Based on the results of a meta-analysis of a handful of national level physician requirement studies, the COGME recommended ratios of 60-80 primary care physicians per 100,000 population and 85-105 non-primary care physicians per 100,000.

The Division of Shortage Designation of the United States Department of Health and Human Services has formally defined Health Professional Shortage Areas (HPSAs). One of the key factors in the assessment of whether an area, population, or facility qualifies as a HPSA is the population-to-provider ratio.[5] Thus, with the available data on physicians, it is possible to make some crude assessments of the potential designation of areas of California as HPSAs.

Table 4-6 provides the active patient care physicians and primary care physicians per 100,000 resident

[5] Other key factors for designating primary care HPSAs include: whether the area is rational for the delivery of services; primary care services in contiguous areas are overutilized, excessively distant, or otherwise inaccessible; characteristics of the population, including low-income, Medicaid eligible, migrant or season farm workers, the homeless; as well as a host of other factors. The population to primary care ratio for designation of a HPSA is 3,500:1 (about 28.6 providers per 100,000 population), but may be as low as 3000:1 (about 33.3 providers per 100,000 population) in a special population HPSA.

population by county. As evinced in the table, some counties in the state fell below the provider-to-population ratios recommended by the COGME and the federal Division of Shortage Designation. While this method of identifying shortage areas is crude, it does indicate that there are certain areas of the state that deserve more attention in terms of the existing physician supply.

Table 4-6

Estimated Numbers of Active Patient Care Physicians in California by County, 2002

County	Active Patient Care Physicians	Population	Active Patient Care Physicians/ 100,000 Population	Primary Care* Physicians/ 100,000 Population	Non-Primary Care Physicians/ 100,000 Population
Alameda	3,163	1,513,356	209	95	114
Contra Costa	2,019	953,069	212	92	120
Marin	1,145	250,818	457	160	296
Napa	367	131,039	280	101	179
San Francisco	3,425	795,577	431	170	260
San Mateo	1,877	770,102	244	94	149
Santa Clara	4,090	1,826,362	224	98	126
Santa Cruz	573	268,737	213	93	121
Solano	583	416,292	140	68	72***
Sonoma	1,058	477,879	221	102	119
Bay Area	***18,300***	***7,403,231***	***247***	***105***	***143***
Monterey	658	417,185	158	69	89
San Benito	42	55,275	76	47***	29***
San Luis Obispo	594	269,272	221	82	139
Santa Barbara	939	422,587	222	91	132
Ventura	1,342	773,304	174	76	97
Central Coast	***3,575***	***1,937,623***	***185***	***79***	***107***
Alpine	0	1,292	0	0**	0
Calaveras	33	44,709	74	45***	29***
Mono	22	11,247	196	53***	142
San Joaquin	762	607,331	125	64	62***
Stanislaus	665	485,123	137	66	71***
Tuolumne	96	58,819	163	78	85
Central Valley	***1,578***	***1,208,521***	***131***	***64***	***66******

Table 4-6 (cont.)

Estimated Numbers of Active Patient Care Physicians in California by County, 2002

County	Active Patient Care Physicians	Population	Active Patient Care Physicians/ 100,000 Population	Primary Care* Physicians/ 100,000 Population	Non-Primary Care Physicians/ 100,000 Population
Riverside	1,882	1,681,186	112	51***	61***
San Bernardino	2,316	1,816,378	128	57***	70***
Inland Empire	***4,198***	***3,497,564***	***120***	***54******	***66*****
Los Angeles	***19,778***	***10,007,779***	***198***	***82***	***116***
Amador	58	35,626	163	98	65***
Colusa	12	23,055	52	35***	17***
El Dorado	245	174,481	140	69	71***
Nevada	205	102,243	201	91	110
Placer	607	261,526	232	109	123
Sacramento	2,452	1,259,423	195	79	116
Sierra	0	3,469	0	0**	0***
Sutter	165	85,982	192	101	91
Yolo	449	170,518	263	120	144
Yuba	69	65,902	105	58***	47***
North Valley	***4262***	***2,182,225***	***195***	***86***	***110***
Butte	385	218,750	176	76	100
Del Norte	46	32,430	142	71	71***
Glenn	9	31,267	29	16**	13***
Humboldt	274	129,994	211	95	115
Lake	74	64,047	116	61	55***
Lassen	27	37,556	72	53***	19***
Mendocino	171	93,496	183	94	89
Modoc	5	10,704	47	28*	19***
Plumas	29	21,178	137	90	47***
Shasta	391	183,946	213	84	128
Siskiyou	67	46,035	146	89	56***
Tehama	51	58,775	87	44***	43***
Trinity	11	13,745	80	73	7***
Northern California	***1,540***	***941,923***	***163***	***76***	***87***
Orange	***6,733***	***2,910,976***	***231***	***99***	***132***
Imperial	106	167,840	63	30***	33***
San Diego	6,197	3,066,423	202	80	122
San Diego	***6,303***	***3,234,263***	***195***	***77***	***118***

Table 4-6 (cont.)

Estimated Numbers of Active Patient Care Physicians in California by County, 2002

County	Active Patient Care Physicians	Population	Active Patient Care Physicians/ 100,000 Population	Primary Care* Physicians/ 100,000 Population	Non-Primary Care Physicians/ 100,000 Population
Fresno	1,298	839,582	155	72	83
Inyo	35	18,582	188	113	75***
Kern	824	712,198	116	57***	59***
Kings	93	132,092	70	41***	30***
Madera	113	135,695	83	43***	40***
Mariposa	9	17,659	51	34***	17***
Merced	204	224,709	91	49***	42***
Tulare	409	397,616	103	54***	49***
South Valley	***2,985***	***2,478,133***	***120***	***59******	***61*****
Total	**69,252**	**35,802,238**	**193**	**83**	**111**

** In this table, primary care includes: General/Family Practice, General Internal Medicine, General Pediatrics, and Obstetrics and Gynecology. The inclusion of Obstetrics and Gynecology is necessary to match the federal definition of primary care.*
***Falls below HPSA threshold for designation as a shortage area.*
****Falls below COGME recommended physician to population ratios.*
Note: The sum of primary care physicians and non-primary care physicians may not equal all active physicians due to rounding.
Sources: American Medical Association Physician Masterfile, December 2002; California Department of Finance

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PHYSICIAN SUPPLY AND DEMAND FORECASTS THROUGH 2015

Since the mid-1960s, the nation has struggled with a series of physician workforce issues: determining the appropriate number of physicians needed to adequately care for the population; the role of international medical school graduates; the mix of primary care and non-primary care physicians; lack of diversity in medicine; mal-distribution of existing physician resources; and, more recently, the evolving demographics of the profession.

I. Growth of the Physician Workforce in the U.S.: 1960 to the present

Between 1960 and 1980, the number of allopathic medical schools in the U.S. grew from 85 to 126, and the number of graduates more than doubled from 7,081 to 15,113 (AAMC 2001). Moreover, the nation's physician supply grew rapidly, increasing from 235,303 active allopathic physicians in 1965 to 316,491 in 1975 (AMA 1976). In 1976, in response to concerns about the rapidly growing supply of physicians, the Graduate Medical Education National Advisory Committee (GMENAC) was established to advise the nation on how many physicians were needed in the U.S., in total and by specialty (GMENAC 1981). In 1980, GMENAC concluded that the nation faced a potentially serious surplus and recommended that the nation limit the number of medical school positions and severely restrict the number of international medical school graduates (IMGs) entering the U.S. (GMENAC 1981).

When GMENAC issued its report in 1980, there were 419,228 active physicians in the U.S. (Salsberg and Forte 2002). The surplus GMENAC envisioned was based on an estimate that the number of physicians would grow to 535,750 by 1990 and 642,950 by 2000 unless steps were taken to reduce the growth in physicians (GMENAC 1981).

Concerns about a potential surplus escalated with the publication of several papers in the early 1990s suggesting that the expansion of managed care and its emphasis on primary care would lead to an even greater surplus of physicians than predicted by GMENAC, especially medical and surgical specialists (Weiner 1994, 1995, Gamliel et al 1995; Wennberg 1993). In fact, Weiner estimated that under certain managed care expansion scenarios the nation required between 138 and 144 patient care physicians per 100,000 population which was well below the 191 physicians per 100,000 population suggested by GMENAC (Salsberg and Forte 2002). Since the nation already had 214 active physicians per 100,000 in 1990 and was experiencing a period of physician supply growth, the specter of a massive surplus of physicians by the turn of the century was raised (Forte and Salsberg 2002). This concern was also echoed by the national Council on Graduate Medical Education (COGME). In several reports between 1992 and 1998, the COGME reaffirmed its concern with a potential surplus of physicians (COGME 1992; 1994; 1995a; 1995b; 1996; 1998).

In 2000, there were approximately 779,723 active physicians in the U.S., or 276 physicians per 100,000 population. However, if the GMENAC methodology for calculating physician supply is used, including a

downward adjustment for physicians in training, the supply of physicians in 2000 would be 676,381, or 240 physicians per 100,000 population. Thus, as predicted by GMENAC, the physician supply in the U.S. grew very rapidly. Between 1980 and 2000, the physician supply in the U.S. increased by more than 320,000 physicians.

II. Physician Workforce Policy: 1986 to the present

Although the federal government does not control the education, training and supply of physicians in the U.S., a series of publicly supported reports and studies along with the work of the national Council on Graduate Medical Education (COGME) have provided important guidance to the medical education and training community. COGME was authorized by Congress in 1986 to act as a federal physician workforce planning group (Grumbach 2002a).

A central charge of COGME is to make policy recommendations with respect to the adequacy of the supply and distribution of physicians in the United States including current and future shortages or excesses of physicians in the medical and surgical specialties and subspecialties. Since 1993, COGME has held a set of physician workforce policy goals centered around its 110/50-50 recommendations, first articulated in its *Third Report.*

The 110/50-50 recommendations called for reducing the number of physicians entering residency training from what was then 140% to 110% of the number of graduates from allopathic and osteopathic medical schools in the United States in 1993 and increasing the percentage of those graduates who complete training and enter practice as generalists from the level then at 30% to at least 50%. Several years later, COGME's *Eighth Report* (1996) provided projections of physician supply and requirements that supported the sagacity of the recommendations laid out in the *Third Report*.

In assessing the progress made towards the COGME 110/50-50 goals, the *Fourteenth Report* (1999), found that as of the 1997-98 academic year, the nation's first year residents numbered approximately 129% of the number of graduates of allopathic and osteopathic medical schools in the United States, and that it would be necessary to reduce the number of first year residents by about 3,400 to reach the 110% goal. Moreover, the *Fourteenth Report* found that while the number of generalists completing training each year had increased from earlier periods, the nation was still training too few generalists and too many specialists.

Moreover, several examinations of the balance of supply of and demand for physicians suggested that the nation may be facing a shortage rather than a surplus of physicians in the coming years (Cooper 2002; Cooper et al 2002; Cooper et al 2003; Bland and Isaacs 2002; Forte et al. 2000). The work of Cooper, especially, started with the premise of a physician marketplace where consumers purchase services from physicians – the important drivers in such a system are population growth and population wealth.

The arguments and justifications employed in the *Third Report*, however, were not based on market considerations. Instead, they were based on public health considerations including universal access to health care, cost efficiency, and the goals of cost-effective levels of physician supply and the appropriate mix of generalists to provide for the health needs of the United States. The empirical evidence to support the recommended generalist/specialist mix (50-50) was drawn from international comparisons and from staffing patterns of closed managed care health care systems. As was revealed in *Fourteen Report* and other work, the models that informed the 110/50-50 recommendations were based on a health care delivery systems which had never been implemented as pervasively as predicted (Grumbach 2002a), had changed sufficiently to render the recommendations obsolete, or had problems of their own (i.e., international supply/need imbalances).

Ultimately, in 2002 the COGME commissioned a report to take another look at physician workforce projections. While the resultant report is still under review, the findings suggest a best case scenario of an adequate physician supply in 2020, but indicate that a substantial physician shortage is likely.

III. Approaches to Forecasting Physician Supply and Demand

The two basic approaches to examining physician workforce requirements, the first based on market demand, the other based on public health goals (need), have been long recognized by health workforce researchers. The demand approaches examine economic indicators such as: the functional relationships between the volume of medical services populations desire to consume at given levels of cost; financial resources; population size; individual desires and preferences as reflected in the psychological wants of populations; as well as the quality of the job market for physicians in specific specialties in specific geographical areas. The need approaches attempt to incorporate concerns around public health and normative public policy that promotes the health of the nation in a financially responsible manner.

Not surprisingly, as the assumptions underlying the two basic approaches are different, many times the conclusions and policy recommendations drawn from analyses based on these approaches differ. Proponents of both approaches have argued that employing only one of these approaches may be a necessary but insufficient basis for developing physician workforce policy. Using a market-based approach alone can produce recommendations which mirror the current health care delivery system, with all of its advantages and disadvantages, while considering a need-based approach alone can produce unreachable policy goals and untenable policy recommendations due to disagreement with society's desires and preferences.

IV. Factors Affecting Physicians Supply and Demand

Supply

In order to accurately forecast the supply of physicians in a geographic location, it is helpful to take into consideration the following:[6]

1) *The overall number of new entrants into the physician workforce and the source of the new entrants;*

2) *The gender distribution of the current physician supply and of new entrants and its effect on the relative number of hours spent in professional activities (to accurately calculate FTEs);*

3) *The age distribution of the current physician supply;*

4) *Retirement, death, and other separation rates of the current physician supply;*

5) *The specialty distribution of the current physician supply and the specialty choices of new entrants;*

6) *The rates of different types of professional activities (patient care, teaching, research, etc.) of the current physician supply;*

7) *Physician migration patterns (both into and out of a particular area).*

In addition, over the last two decades, the physician workforce has experienced a number of key transformations. To the extent that data are available, these transformations should be considered:

Demographic Evolution and Physician Work Effort

Women in Medicine

Women have made great strides in medicine over the past 20 years, nearly tripling their representation in the profession. Currently making up about 25% of the physician workforce, women will continue to become a larger part of the workforce as they currently make up nearly 50% of the students enrolled in U.S. medical schools (Salsberg and Forte 2002).

A number of studies have documented that women work fewer hours over the course of their professional work life than men (Kletke, Marder and Silberger 1990; Bobula 1980; Martin et al 1988; Cooper 1994; AMWAC/AHIW 1996; 1998; Sullivan and Buske 1998; Forte and Salsberg 1999). This phenomenon may reflect time taken for child-rearing, providing care for elderly parents or other relatives, and other family concerns. Recent research has, however, suggested that women are not the only physicians working less. Instead, some (Bland and Isaacs 2002; Gelfand et al 2002; Dorsey et al 2003) claim that this phenomenon of women working fewer hours is part of a larger generational phenomenon, perhaps not limited to medicine

[6] Although this discussion is presented at the national level, it is applicable at the state, regional, and to a lesser extent, local levels as well.

(Bond et al 1998; Lang 2000; Gutner 2002). Interestingly, there are also some indications that older physicians are reducing the hours they work (Cooper 2002).

Aging of the Physician Workforce

Like the rest of the U.S. population, physicians, as a group, are growing older. In fact, between 1982 and 2001 the proportion of physicians ages 65 and older increased from 8% to 11%. In 2001, there were more than 84,000 practicing physicians who were 65 years of age or older, another 118,000 between ages 55 and 64 who will reach age 65 by 2011, and another 203,000 between ages 45 and 54 who will reach age 65 by 2021 (AMA 1983; 2003).

Separation from the Physician Workforce

In some ways separation from the physician workforce is related to age. As a physician ages, he/she is more likely to leave practice for one reason or another, be it retirement, death, or other reasons. With the aging of the physician population, a larger and larger proportion of the physician workforce will be reaching the traditional age of retirement in the near future.

There is no way to know with certainty the actual retirement patterns of physicians in future years. If the baby-boom generation of physicians retires earlier than past generations, this would significantly reduce the supply of physicians in the next decade. On the other hand, if physicians are working fewer hours per week due to changing lifestyle choices, they may stay in practice for a longer period of time, not having as much chance to "burn-out" or become dissatisfied for some other reason. This phenomenon might lead to an increase in the supply of physicians in the future.

Productivity Changes due to Technology Developments

Another important factor than can influence the available supply of physicians is their productivity. Productivity, in this instance, is defined as output per unit of time spent in practice. Currently, there are, and certainly in the future, there will be more, changes occurring in medical practice that allow physicians to practice more efficiently. New medical technologies, particularly in the area of information systems, could lead to an increase in physician productivity; for example, the electronic medical record could allow physicians to quickly, easily, and accurately access and assess all the necessary information on a patient's history instead of having to order the file be sent to him/her, then shuffling through the pages in the file. Estimates of the potential productivity gains through the use of new technologies or implementation of already existing technologies are widely variable (Blumenthal 2002; Masys 2002; Goldsmith et al 2003). A recent study suggests a potential gain of up to 20% through the use of technology (Corrigan 2003).

Resident and Fellow Work Hour Restrictions

The recent implementation of regulations limiting resident and fellow work hours to 80 or fewer should be taken into account when estimating the future physician supply. While the general impact of these regulations is clear -- the total supply of physicians (FTEs) will decrease -- it is unclear what the magnitude of the effect will be. It is unclear how much of the reduction in hours worked per week will come from patient care compared to educational activities. It is also possible that reduced work hours during training

and increased flexibility in scheduling will contribute to changes in new physicians' practice patterns after training such as increased job sharing and reduced patient care hours, potentially enhancing the different practice patterns already observed among the newest generation of physicians.

Specialty Distribution and Choices

The issue of specialty distribution and choice has less to do with the overall supply of physicians than with the types of services provided by physicians. The specific specialty a physician practices has implications for the types of services provided. There have been a number of attempts at understanding the reasons behind physicians' specialty choices (Hay 1991; Hurley 1991; Nicholson 2002; Puccio et al 2002; Newton and Grayson 2003; Dorsey et al 2003). The factors most often cited to explain variation in specialty choice include expected income, intellectual content of the specialty, research opportunities in the specialty, prestige of the specialty, gender and race/ethnicity of the physician, family considerations, and so forth.

Changing Physician Professional Activities

Being a physician involves a variety of activities, including patient care, medical teaching, medical research, and other professional activities. Physicians, however, are not limited to those types of activities. The rate at which the supply of physicians in the nation participates in activities within their field of expertise (i.e., medicine) and activities outside the realm of medicine directly affects the number of available physicians. If activities outside of the scope of what are currently considered the professional activities of a physician (e.g., physicians working as financial analysts) become more attractive to physicians, the supply of physicians will decrease.

Moreover, changes in the distribution of activities in which a physician participates could also have effects on the supply of physicians. For example, the average physician typically spends the most amount of his/her time in patient care. If more physicians devoted more time to research, the supply of physicians providing patient care services would decrease.

Demand

In order to accurately forecast the demand for physicians in a geographic location, it is helpful to take into consideration the following:

1) *Physician utilization rates by age, gender, and race/ethnicity;*

2) *Physician utilization rates by practice setting and insurance status;*

3) *Current and future population counts by age, gender, race/ethnicity, practice setting, and insurance status.*

In addition, forecasts of the future demand for physicians should seek to account for the following key factors:

Population Wealth

Based on a perspective currently championed by Cooper et al (2002; 2003) (past proponents include

Schwartz and colleagues in the late 1980s and early 1990s and Roehrig and Eisenstein [1999]), the trend in population wealth should be considered in demand forecasts. This perspective suggests that there are four major factors driving demand for physician services: economic expansion, population growth, work effort of physicians, and services provided by other practitioners (i.e., non-physician clinicians). Cooper et al suggest that the most important of the four factors affecting physician demand is economic expansion. They find a consistent correlation between the supply of physicians and economic growth. However, Cooper and colleagues suggest that the relationship is complex. Economic growth induces growth in demand for health services, causing a rise in health care spending. This growth in health care spending, in turn, leads to a growth in the health care workforce, of which physicians are an important part.

This perspective is certainly not without opponents (e.g., Grumbach 2002b; Barer 2002; Weiner 2002). It is easy to believe that in an environment of increasing health care costs and declining budgets, resistance to this sort of perspective is assured. However, only one published research article has presented data that challenge Cooper and colleagues' findings (Anderson et al 2003).

Utilization Rate Changes

Because one of the most important drivers of demand for physicians are utilization rates, it is important to understand how those rates might be changing over time. With respect to age, independent investigation shows that utilization rates are changing. Most observers are familiar with findings that as the population grows older, overall utilization will increase because utilization rates increase with age. The number of people over 65 years of age is increasing and will increase significantly in the coming years. Clearly, the aging of the population will lead to an increase in demand for physician services. However, if one examines utilization rates over time, especially physician office visits, it becomes evident that use rates by age group are changing.

Analysis of the National Ambulatory Medical Care Survey (NAMCS) data from 1980, 1990, and 2000 on visits to physician offices by age group indicates that the number of physician visits per capita for age groups over 45 years of age has been increasing over the past couple of decades. There is reason to believe that this trend will continue over the next decade and may even accelerate as the baby-boom generation ages. The baby-boom generation has grown up with high expectations for health care and experienced higher utilization rates than those of previous generations. In addition, as the baby-boomers age, many, although certainly not all, will have disposable income that they may choose to spend on health care (Knickman et al 2003).

Between 1980 and 2000 crude per capita visits to physician offices increased from 2.4 to 2.9. This increase was not evenly distributed across age groups, however. The largest gain was experienced among persons 75 to 84 years of age, increasing from 3.5 visits to 6.3 visits annually. All of the other groups above age 45 experienced gains as well, except the 85 years of age and above group. It turns out, however, that even though there was a global increase in utilization, for persons in the 15-24 year old and the 25-34 year

old age groups utilization rates declined between 1980 and 2000. Further, the more recent changes in utilization (i.e., 1990 compared to 2000) demonstrated a uniform set of increases and declines, with all groups below age 45 having experienced declines in annual per capita visits to physician offices and those ages 45 and above having experienced increases in annual per capita physician office visit rates.

Elimination of Unnecessary Services

One of the problems associated with using actual utilization rates observed in the population under study is that while they are accurate, they too closely resemble reality, including not only the beneficial qualities of the current health care delivery system, but also its faults. In particular, the unnecessary services common in the current health care delivery system are reflected in those utilization rates.

There are a number of reasons to believe some current use is unnecessary or only marginally beneficial. Possible causes include: poor physician performance due to an oversupply of physicians in a geographical area; the complexities of current treatment modalities and the inability of individual physicians to sort through them competently enough to understand which test/treatment is appropriate; advertisements targeted toward the public that in turn induce patients to demand services from their physicians; the financial pressure on facilities; the outright greed of a small minority in the medical profession; the ongoing medical liability crisis and the resultant practice of "defensive medicine;" a financing/reimbursement system that gives incentives to provide services without regard to outcomes. Regardless of the causes of the unnecessary provision, there exists a long-standing, compelling argument that a substantial portion of the services provided by physicians and other practitioners in the health care delivery system are simply unnecessary or of marginal benefit. Further, it is argued that it is these unnecessary services that are driving up health care costs and spending in the aggregate. And thus, proponents of this perspective argue that the elimination of these unnecessary and marginal services provides two essential goods: efficiency and cost savings (Fisher et al 2003a).

The work of Wennberg and colleagues showing the diminishing rates of benefit to the community of additional physicians can certainly be thought of as supporting this perspective. Recently, the work of Fisher et al (2003a; 2003b) showing the lack of relationship (and sometimes negative relationship) between the provision of services, level of spending on services, health care outcomes, and patient satisfaction provides additional support for the perspective.

Approaching the issue from a slightly different perspective, Weiner (1994; 1995; 2004) and others (Hart et al 1997; Goodman et al 1996) have attempted to estimate demand for physician services in a way that bypasses these unnecessary services by examining closed, organized systems of health care delivery that employ more or less rigorous utilization review. In the early and mid 1990s, these examinations revolved around staff-model HMOs. This work has most recently evolved to examine large prepaid group practices having contracts with managed care plans (Weiner 2004). The earlier work found that staff-model HMOs were able to provide equivalent quality of care with drastically smaller physician staffing levels. Those who looked more closely at these organizations found that patients were actually using quite a bit of out-of-

network services and challenged this early work (Hart et al 1997). This work continues, however; and the most recent updates show that while in the past these delivery systems may have required lower staffing levels, over time they have expanded -- although not quite to the levels observed outside of these delivery systems (Weiner 2004).

The most recent research in this area (Fisher et al 2003b; Weiner 2004), suggests that between 20% and 35% of the services currently provided are unnecessary or would not occur under a more rigorous system of utilization review.

V. California Physician Demand Forecasts through 2015

Baseline physician demand was forecast using a model that included the physician utilization rates by age, gender, metropolitan/nonmetropolitan designation, and type of health insurance of California's population. Current and projected age and gender data were obtained from the California Department of Finance. Information on the type of insurance (Medicare, Medicaid, Commercial HMO, Commercial non-HMO, and uninsured) was extrapolated from various sources.[7] These data were fed into a modified version[8] of the Bureau of Health Profession's Physician Demand Model (PDM) (previously called the Integrated Requirements Model - IRM). Forecasts of physician demand in 18 specialties were generated for the years 2003 to 2015 and aggregated to produce state level estimates of demand. As a starting point, demand is initially set at the level of supply in 2002. It should be noted that there are already areas that are underserved in the state, so it is acknowledged that supply and demand are not equivalent outside the model.

Initially, two future demand environments were created to show the breadth of potential futures for physician demand in California. The first environment is one in which current level of health insurance among the residents of California remained constant throughout the forecast period.

[7] Three sources of insurance data were used for input into the model. They were:

- Baumgarten, A. California Managed Care Review 2002, (available at http://www.chcf.org/print.cfm?itemID=23119);
- The U.S. Census Bureau, September 2002, Table 4, Percent of people without health insurance coverage for the entire year by state (3-year average): 1999-2001;
- Centers of Medicare and Medicaid Services (CMS).

[8] Modified to include California-specific inputs (population characteristics).

Table 5-1

Projected Demand for Physicians in California, 2002-2015: Constant Insurance Environment, Baseline Scenario (Demand Scenario 1)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	91,993	36,363,502	253.0
2004	93,462	36,899,907	253.3
2005	94,745	37,372,444	253.5
2006	96,094	37,838,342	254.0
2007	97,504	38,364,421	254.2
2008	99,107	38,893,801	254.8
2009	100,671	39,425,878	255.3
2010	102,280	39,957,616	256.0
2011	103,497	40,402,397	256.2
2012	104,844	40,852,345	256.6
2013	106,202	41,314,152	257.1
2014	107,574	41,784,860	257.4
2015	109,461	42,370,899	258.3
Percent Change	21.0%	18.3%	2.2%

From the base year of 2002 to 2015 the model projected a growth in demand for physicians of 21% in the constant insurance environment. The projected growth in demand was equivalent to 2.2% growth in the physician to population ratio.

The second environment is one in which health insurance was extended to all residents of the state. This scenario is referred to as the expanded insurance environment.

Table 5-2

Projected Demand for Physicians in California, 2002-2015: Expanded Insurance Environment, Baseline Scenario (Demand Scenario 1)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	101,040	36,363,502	277.9
2004	102,651	36,899,907	278.2
2005	104,058	37,372,444	278.4
2006	105,531	37,838,342	278.9
2007	107,067	38,364,421	279.1
2008	108,794	38,893,801	279.7
2009	110,480	39,425,878	280.2
2010	112,215	39,957,616	280.8
2011	113,527	40,402,397	281.0
2012	114,953	40,852,345	281.4
2013	116,395	41,314,152	281.7
2014	117,839	41,784,860	282.0
2015	119,847	42,370,899	282.9
Percent Change	32.5%	18.3%	11.9%

In this environment, the model projected that demand for physicians would increase by more than 32% from 2002 to 2015. The projected growth in demand was equivalent to an 11.9% growth in the physician to population ratio.

In terms of the individual specialties, the model predicted as follows:

Table 5-3

Projected Demand by Specialty for Physicians in California, 2002 and 2015: Constant Insurance Environment, Baseline Scenario (Demand Scenario 1)

Specialty	2002	2015	% Change
General Family Practice	11,947	14,562	21.9%
General Internal Medicine	13,730	16,919	23.2%
Pediatrics	7,136	7,872	10.3%
OB/GYN	5,207	5,967	14.6%
Cardiology	2,320	2,983	28.6%
Other Internal Medicine	7,953	9,905	24.5%
General Surgery	3,632	4,503	24.0%
Orthopedic Surgery	2,990	3,649	22.0%
Otolaryngology	1,193	1,423	19.3%
Urology	1,158	1,468	26.8%
Ophthalmology	2,403	3,001	24.9%
Other Surgery	3,015	3,767	24.9%
Emergency Medicine	3,666	4,299	17.3%
Psychiatry	5,809	6,795	17.0%
Anesthesiology	5,033	6,203	23.2%
Radiology	3,594	4,402	22.5%
Pathology	2,240	2,723	21.6%
Other	7,444	9,020	21.2%
Total	90,470	109,461	21.0%

Table 5-4

Projected Demand by Specialty for Physicians in California, 2002 and 2015: Expanded Insurance Environment, Baseline Scenario (Demand Scenario 1)

Specialty	2002	2015	% Change
General Family Practice	11,947	15,691	31.3%
General Internal Medicine	13,730	18,966	38.1%
Pediatrics	7,136	8,515	19.3%
OB/GYN	5,207	6,991	34.3%
Cardiology	2,320	3,261	40.6%
Other Internal Medicine	7,953	11,047	38.9%
General Surgery	3,632	4,995	37.5%
Orthopedic Surgery	2,990	4,108	37.4%
Otolaryngology	1,193	1,553	30.2%
Urology	1,158	1,630	40.8%
Ophthalmology	2,403	3,160	31.5%
Other Surgery	3,015	4,156	37.8%
Emergency Medicine	3,666	4,240	15.7%
Psychiatry	5,809	6,719	15.7%
Anesthesiology	5,033	6,877	36.6%
Radiology	3,594	4,923	37.0%
Pathology	2,240	3,045	35.9%
Other	7,444	9,970	33.9%
Total	90,470	119,847	32.5%

In order to present a more complete set of potentialities, baseline models in both the constant insurance and expanded insurance environments were modified by taking into account a number of the factors outlined in section IV above.

First, the effect of the general economy on demand was addressed. As stated above in section IV, the economy and physician demand are positively correlated. In this scenario it was assumed that the per capita gross state product of California would grow at a rate of 1% annually and that demand for physicians would increase by 0.75% annually for every 1% annual growth in the per capita gross state product.[8] The results in both the constant insurance and the enhanced insurance environment were as follows:

Table 5-5

Projected Demand for Physicians in California, 2002-2015: Constant Insurance Environment with Expanding Economy (Demand Scenario 2)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	91,993	36,363,502	253.0
2004	94,167	36,899,907	255.2
2005	96,180	37,372,444	257.4
2006	98,286	37,838,342	259.8
2007	100,482	38,364,421	261.9
2008	102,907	38,893,801	264.6
2009	105,322	39,425,878	267.1
2010	107,816	39,957,616	269.8
2011	109,925	40,402,397	272.1
2012	112,201	40,852,345	274.6
2013	114,516	41,314,152	277.2
2014	116,876	41,784,860	279.7
2015	119,830	42,370,899	282.8
Percent Change	32.5%	18.3%	11.9%

Table 5-6

Projected Demand for Physicians in California, 2002-2015: Expanded Insurance Environment with Expanding Economy (Demand Scenario 2)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	101,040	36,363,502	277.9
2004	103,425	36,899,907	280.3
2005	105,634	37,372,444	282.7
2006	107,939	37,838,342	285.3
2007	110,338	38,364,421	287.6
2008	112,965	38,893,801	290.4
2009	115,584	39,425,878	293.2
2010	118,289	39,957,616	296.0
2011	120,578	40,402,397	298.4
2012	123,019	40,852,345	301.1
2013	125,507	41,314,152	303.8
2014	128,029	41,784,860	306.4
2015	131,200	42,370,899	309.6
Percent Change	45.0%	18.3%	22.5%

[8] This is a conservative estimate of California's gross state product. Data from the California Department of Finance show that between 1986 and 2001, the average annual growth in GSP of California (in constant 1996 dollars) was about 3.5%. (California Statistical Abstract 2003, Table D3). Accounting for population growth, the average annual growth in per capita GSP in California (in constant 1996 dollars) was about 1.8%. The projected relationship between per capita gross state product and demand for physicians was extrapolated from the national data presented in Cooper et al. 2002.

Second, the effect of the changing age-specific utilization rates on demand was addressed. As stated above in section IV, over the past twenty years, there have been changes in how individuals use physician services. Focusing on the decade between 1990 and 2000, those under age 45 experienced a decrease in the number of physician visits per year while those 45 years of age and older experienced an increase in annual physician visits. In this scenario it was assumed that age-specific physician utilization rates in California between 2002 and 2015 would change as they did between 1990 and 2000 at the national level.[9] The results in both the constant insurance and the enhanced insurance environment were as follows:

Table 5-7

Projected Demand for Physicians in California, 2002-2015: Constant Insurance Environment with Evolving Age-Specific Utilization Rates (Demand Scenario 3)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	92,357	36,363,502	254.0
2004	94,244	36,899,907	255.4
2005	96,131	37,372,444	257.2
2006	98,209	37,838,342	259.5
2007	100,286	38,364,421	261.4
2008	102,364	38,893,801	263.2
2009	104,442	39,425,878	264.9
2010	106,519	39,957,616	266.6
2011	108,826	40,402,397	269.4
2012	111,132	40,852,345	272.0
2013	113,439	41,314,152	274.6
2014	115,745	41,784,860	277.0
2015	118,052	42,370,899	278.6
Percent Change	30.5%	18.3%	10.3%

Table 5-8

Projected Demand for Physicians in California, 2002-2015: Expanded Insurance Environment with Evolving Age-Specific Utilization Rates (Demand Scenario 3)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	101,254	36,363,502	278.5
2004	103,139	36,899,907	279.5
2005	105,024	37,372,444	281.0
2006	107,093	37,838,342	283.0
2007	109,159	38,364,421	284.5
2008	111,207	38,893,801	285.9
2009	113,257	39,425,878	287.3
2010	115,307	39,957,616	288.6
2011	117,593	40,402,397	291.1
2012	119,855	40,852,345	293.4
2013	122,122	41,314,152	295.6
2014	124,378	41,784,860	297.7
2015	126,636	42,370,899	298.9
Percent Change	40.0%	18.3%	18.3%

[9] It should be noted that it is not known whether the residents in California experienced the same changes in utilization rates as evidenced in the national data. For the purposes of these projections, it was assumed that they did.

Third, the effect of the elimination of unnecessary/marginally beneficial services on demand was addressed. As stated above in section IV, it has been found that up to one-third of the current services provided by physicians are unnecessary/marginally beneficial. Assuming that these services could be identified and eliminated efficiently, several scenarios were developed to take this into account. Because California has a long history and high penetration of managed care, however, it was assumed that there is a relatively low level (the U.S. average is estimated at about 27.5%) of unnecessary/marginally beneficial services being provided in the state currently. As such, for the purposes of the forecasts, it was assumed that 5% of the total services provided by physicians in California are unnecessary/marginally beneficial and would be eliminated by 2015.[10] The results in both the constant insurance and the enhanced insurance environment were as follows:

Table 5-9

Projected Demand for Physicians in California, 2002-2015: Constant Insurance Environment with the Elimination of Unnecessary Services (Demand Scenario 4)

Year	Physicians	Population	Per 100,000
2002	90,147	35,802,238	251.8
2003	91,336	36,363,502	251.2
2004	92,461	36,899,907	250.6
2005	93,392	37,372,444	249.9
2006	94,378	37,838,342	249.4
2007	95,415	38,364,421	248.7
2008	96,629	38,893,801	248.4
2009	97,795	39,425,878	248.0
2010	98,992	39,957,616	247.7
2011	99,801	40,402,397	247.0
2012	100,725	40,852,345	246.6
2013	101,650	41,314,152	246.0
2014	102,579	41,784,860	245.5
2015	103,988	42,370,899	245.4
Percent Change	15.4%	18.3%	-2.5%

[10] The assumption of a 5% reduction in unnecessary/marginally beneficial services provided in the state by 2015 is justifiable for several reasons. First, the most recent work of Weiner (2004) showing the differences in staffing in prepaid group practices and other settings is based partially on the experience of the Kaiser network in California, and thus, California as an aggregate should have fewer unnecessary/marginally beneficial services provided. Second, even though the Kaiser network is a relatively small part of the overall health care delivery system in the state, other work (e.g., Baker 1999) has shown that staffing and other practice efficiencies tend to affect not only those directly involved with managed care organizations, but also become pervasive in other practice settings and organizations, effecting the entire health care delivery system. This work suggests that the presence of the Kaiser network in California has effects not only on those physicians and group practices directly connected to it, but also on the other physicians in the community. The net effect is that the state already enjoys a lower rate of unnecessary/marginally beneficial services than states without a Kaiser presence. Finally, one of the main criticisms (e.g., Salsberg and Forte 2004) of Weiner and others' work (e.g., Fisher et al 2003a; 2003b) in relation to unnecessary/marginally beneficial service provision is that the mechanisms of identification and elimination of such services are unclear, and thus, the possible solutions to the problem are less than certain. The result is that even though the problem has been identified and acknowledged, predicting that the entirety of unnecessary/marginally beneficial services would be eliminated is inappropriate. For all of these reasons, the 5% assumption, while certainly crude, was reasonable to make in predicting physician requirements in the state.

Table 5-10

Projected Demand for Physicians in California, 2002-2015: Expanded Insurance Environment with the Elimination of Unnecessary Services (Demand Scenario 4)

Year	Physicians	Population	Per 100,000
2002	90,147	35,802,238	251.8
2003	100,318	36,363,502	275.9
2004	101,551	36,899,907	275.2
2005	102,571	37,372,444	274.5
2006	103,647	37,838,342	273.9
2007	104,773	38,364,421	273.1
2008	106,074	38,893,801	272.7
2009	107,323	39,425,878	272.2
2010	108,608	39,957,616	271.8
2011	109,472	40,402,397	271.0
2012	110,437	40,852,345	270.3
2013	111,407	41,314,152	269.7
2014	112,368	41,784,860	268.9
2015	113,855	42,370,899	268.7
Percent Change	26.3%	18.3%	6.7%

For the next scenario, both the effect of the economy and the elimination of unnecessary/marginally beneficial services were considered in both insurance environments. The same assumptions (1% growth in California per capita GSP; 5% of all services provided are unnecessary and would be eliminated) made previously held for this hybrid scenario. The results were as follows:

Table 5-11

Projected Demand for Physicians in California, 2002-2015: Constant Insurance Environment with Expanding Economy and the Elimination of Unnecessary Services (Demand Scenario 5)

Year	Physicians	Population	Per 100,000
2002	90,147	35,802,238	251.8
2003	91,336	36,363,502	251.2
2004	93,158	36,899,907	252.5
2005	94,806	37,372,444	253.7
2006	96,531	37,838,342	255.1
2007	98,329	38,364,421	256.3
2008	100,334	38,893,801	258.0
2009	102,313	39,425,878	259.5
2010	104,350	39,957,616	261.2
2011	106,000	40,402,397	262.4
2012	107,793	40,852,345	263.9
2013	109,608	41,314,152	265.3
2014	111,450	41,784,860	266.7
2015	113,839	42,370,899	268.7
Percent Change	26.3%	18.3%	6.7%

Table 5-12

Projected Demand for Physicians in California, 2002-2015: Expanded Insurance Environment with Expanding Economy and the Elimination of Unnecessary Services (Demand Scenario 5)

Year	Physicians	Population	Per 100,000
2002	90,147	35,802,238	251.8
2003	100,318	36,363,502	275.9
2004	102,317	36,899,907	277.3
2005	104,125	37,372,444	278.6
2006	106,011	37,838,342	280.2
2007	107,973	38,364,421	281.4
2008	110,141	38,893,801	283.2
2009	112,282	39,425,878	284.8
2010	114,486	39,957,616	286.5
2011	116,272	40,402,397	287.8
2012	118,186	40,852,345	289.3
2013	120,128	41,314,152	290.8
2014	122,085	41,784,860	292.2
2015	124,640	42,370,899	294.2
Percent Change	38.3%	18.3%	16.8%

For the next scenario, both the effect of changing age-specific physician utilization rates and the elimination of unnecessary/marginally beneficial services were considered in both insurance environments. The same assumptions (age-specific utilization rate changes in 2002 to 2015 would be the same as those between 1990 and 2000; 5% of all services provided are unnecessary and would be eliminated) made previously held for this hybrid scenario. The results were as follows:

Table 5-13

Projected Demand for Physicians in California, 2002-2015: Constant Insurance Environment with Evolving Age-Specific Utilization Rates and the Elimination of Unnecessary Services (Demand Scenario 6)

Year	Physicians	Population	Per 100,000
2002	90,147	35,802,238	251.8
2003	91,697	36,363,502	252.2
2004	93,234	36,899,907	252.7
2005	94,758	37,372,444	253.5
2006	96,455	37,838,342	254.9
2007	98,137	38,364,421	255.8
2008	99,805	38,893,801	256.6
2009	101,458	39,425,878	257.3
2010	103,095	39,957,616	258.0
2011	104,939	40,402,397	259.7
2012	106,766	40,852,345	261.3
2013	108,577	41,314,152	262.8
2014	110,371	41,784,860	264.1
2015	112,149	42,370,899	264.7
Percent Change	24.4%	18.3%	5.1%

Table 5-14

Projected Demand for Physicians in California, 2002-2015: Expanded Insurance Environment with Evolving Age-Specific Utilization Rates and the Elimination of Unnecessary Services (Demand Scenario 6)

Year	Physicians	Population	Per 100,000
2002	90,147	35,802,238	251.8
2003	100,531	36,363,502	276.5
2004	102,034	36,899,907	276.5
2005	103,524	37,372,444	277.0
2006	105,181	37,838,342	278.0
2007	106,820	38,364,421	278.4
2008	108,427	38,893,801	278.8
2009	110,021	39,425,878	279.1
2010	111,601	39,957,616	279.3
2011	113,394	40,402,397	280.7
2012	115,147	40,852,345	281.9
2013	116,888	41,314,152	282.9
2014	118,603	41,784,860	283.8
2015	120,304	42,370,899	283.9
Percent Change	33.5%	18.3%	12.8%

VI. California Physician Supply Forecasts through 2015

A model[11] to forecast the total supply of physicians in California through 2015 was constructed referencing data from 1996 through 2002. The model used the following data:

1) *current number of total physicians located in California (AMA Masterfile)*

2) *physician separation rates (rates of retirement, moving out of practice, death) based on national estimates of these rates (Roehrig 2000)*

3) *number of new entrants (first year residents with no prior U.S. residency training) to residency training in California (AMA 2003), and*

4) *net migration of physicians in and out of California (average annual net migration between 1996 and 2002)*[12]

Based on these data, the model forecast a 19% growth in the supply of active physicians in California between 2002 and 2015. The projected growth in supply was equivalent to 0.4% growth in the physician to population ratio. It should be noted, however, that in this scenario, the supply of physicians in the state peaked in 2008/09 and by 2015 was declining.

[11] Unlike the demand model, the BHPr's supply forecasting system requires data that were not available for the project. Thus, a relatively simple supply forecast model was constructed.

[12] The net migration of California physicians is a calculated figure derived from an initial analysis of the results of using the supply model to predict the number of physicians in the state between 1996 and 2002. Comparison of the predicted supply of physicians with the actual supply produced a difference that we have identified as net physician migration. This identification was reasonable as the model accounted for all other entrances into and separation from the physician supply in the state. For purposes of forecasting the physician supply from 2003 to 2015 the average annual net migration value from 1996 to 2002 was used (900 additional physicians per year).

Table 5-15

Projected Supply of Physicians in California, 2002-2015: Baseline Scenario (Supply Scenario 1)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	92,098	36,363,502	253.3
2004	93,687	36,899,907	253.9
2005	95,234	37,372,444	254.8
2006	96,733	37,838,342	255.6
2007	98,182	38,364,421	255.9
2008	99,577	38,893,801	256.0
2009	100,911	39,425,878	256.0
2010	102,182	39,957,616	255.7
2011	103,385	40,402,397	255.9
2012	104,517	40,852,345	255.8
2013	105,575	41,314,152	255.5
2014	106,558	41,784,860	255.0
2015	107,464	42,370,899	253.6
Percent Change	18.8%	18.3%	0.4%

This forecast was based on the following key assumptions:

1) *No change in the number of new physicians joining the supply annually (i.e., physician production does not increase/decrease);*

2) *No change in historical physician separation rates (i.e., no early/postponed retirement)*

3) *No change in the migration patterns of physician into/out of the state*

In order to present a more complete set of potentialities, several additional supply scenarios were constructed by taking into account two of the factors outlined in section IV above.

First, as noted above, there are data that indicate that physicians are less willing to work the number of hours historically observed among the physician population and are reducing the amount of time they spend practicing per week. For the purposes of these forecasts, it was assumed that there will be a 10% reduction in the number of hours worked per week by physicians over the forecast period. The results were as follows:[13]

[13] It should be noted that for supply scenarios 2 through 4, the units were in terms of 2002 physician equivalents. That is, regardless of the additional factors considered, the forecast of 107,464 physicians held across all scenarios. Any adjustments to number of hours worked per week or rates of productivity would not change that number, but rather its equivalent. Another way to think about this is that the baseline (supply scenario 1) held the FTE per physician ratio constant, while supply scenarios 2 through 4 relaxed that assumption.

Table 5-16

Projected Supply of Physicians in California, 2002-2015: Lifestyle Changes (Supply Scenario 2)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	91,641	36,363,502	252.0
2004	92,762	36,899,907	251.4
2005	93,832	37,372,444	251.1
2006	94,847	37,838,342	250.7
2007	95,804	38,364,421	249.7
2008	96,699	38,893,801	248.6
2009	97,530	39,425,878	247.4
2010	98,293	39,957,616	246.0
2011	98,985	40,402,397	245.0
2012	99,605	40,852,345	243.8
2013	100,149	41,314,152	242.4
2014	100,619	41,784,860	240.8
2015	101,013	42,370,899	238.4
Percent Change	11.7%	18.3%	-5.7%

Second, as noted above, the potential productivity enhancements due to medical innovations, technological developments, re-organizations of medical practice, and so on, could lead to increases in the overall supply of physicians available to care for individuals. For the purposes of these forecasts, it was assumed that there would be a 5% increase in the physician productivity over the forecast period. The results were as follows:

Table 5-17

Projected Supply of Physicians in California, 2002-2015: Productivity Enhancements (Supply Scenario 3)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	92,453	36,363,502	254.2
2004	94,412	36,899,907	255.9
2005	96,341	37,372,444	257.8
2006	98,236	37,838,342	259.6
2007	100,094	38,364,421	260.9
2008	101,909	38,893,801	262.0
2009	103,676	39,425,878	263.0
2010	105,389	39,957,616	263.8
2011	107,045	40,402,397	264.9
2012	108,639	40,852,345	265.9
2013	110,167	41,314,152	266.7
2014	111,627	41,784,860	267.1
2015	113,017	42,370,899	266.7
Percent Change	24.9%	18.3%	5.6%

For the final supply scenario, both the effect of a reduction in work hours per week and increases in physician productivity were considered. The same assumptions (10% reduction in work hours per week; 5% increase in physician productivity) made previously held for this hybrid scenario. The results were as follows:

Table 5-18

Projected Supply of Physicians in California, 2002-2015: Lifestyle Changes and Productivity Enhancements (Supply Scenario 4)

Year	Physicians	Population	Per 100,000
2002	90,470	35,802,238	252.7
2003	91,992	36,363,502	253.0
2004	93,472	36,899,907	253.3
2005	94,907	37,372,444	253.9
2006	96,291	37,838,342	254.5
2007	97,623	38,364,421	254.5
2008	98,898	38,893,801	254.3
2009	100,111	39,425,878	253.9
2010	101,257	39,957,616	253.4
2011	102,335	40,402,397	253.3
2012	103,341	40,852,345	253.0
2013	104,271	41,314,152	252.4
2014	105,126	41,784,860	251.6
2015	105,904	42,370,899	249.9
Percent Change	17.1%	18.3%	-1.1%

VII. Summary of California Physician Supply and Demand Forecasts through 2015

The assessment of the adequacy of the future physician supply in California in 2015 was accomplished by considering the forecasts of physician supply and demand. Summaries of the findings for each scenario are presented in the tables below. A detailed table that includes all of the calculated differences between projected supply and demand in 2015 can be found in Table A-2 in the Appendix.

Physician Demand

Constant Insurance Environment

- Demand Scenario 1 (Baseline) forecast physician demand under the assumption that rates of health care use remain constant over time by applying these rates to the projected future population of the state. Under this scenario, physician demand would increase from 90,470 in 2002 to 109,461 in 2015 (a 21% increase). The forecast growth is equivalent to a 2.2% increase in the physician demand per 100,000 population in the state.

- Demand Scenario 2 (Economic Expansion) explicitly accounted for the positive relationship between economic growth and physician demand. The scenario forecast physician demand under the assumptions that California's per capita gross state product increases by 1% annually and that demand for physicians increases by 0.75% annually for every 1% annual growth in the per capita gross state product. Under this scenario, physician demand would increase from 90,470 in 2002 to 119,830 in 2015 (a 33% increase). The forecast growth is equivalent to an 11.9% increase in the physician demand per 100,000 population in the state. It should be noted that the relationship modeled in demand scenario 3 is not controlled for in this scenario.

- Demand Scenario 3 (Changing Age-Specific Physician Utilization Rates) forecast physician demand under the assumption that the age-specific physician utilization rates in the state would change in the same way between 2002 and 2015 as has been observed nationally between 1990 and 2000. Under this scenario, physician demand would increase from 90,470 in 2002 to 118,052 in 2015 (a 31% increase). The forecast growth is equivalent to a 10.3% increase in the physician demand per 100,000 population in the state. It should be noted that the relationship modeled in demand scenario 2 is not controlled for in this scenario.

- Demand Scenario 4 (Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the assumption that 5% of the services provided by physicians are unnecessary/marginally beneficial and that those services would be eliminated by 2015. Under this scenario, physician demand would increase from 90,147 in 2002 to 103,988 in 2015 (a 15% increase). The forecast growth, in this case, is equivalent to a 2.5% decrease in the physician demand per 100,000 population in the state.

- Demand Scenario 5 (Economic Expansion and Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the combined assumptions of demand scenarios 2 and 4. Under this scenario, physician demand would increase from 90,147 in 2002 to 113,839 in 2015 (a 26% increase). The forecast growth is equivalent to a 6.7% increase in physician demand per 100,000 population in the state.

- Demand Scenario 6 (Changing Age-Specific Physician Utilization Rates and Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the combined assumptions of demand scenarios 3 and 4. Under this scenario, physician demand would increase from 90,147 in 2002 to 112,149 in 2015 (a 24%) increase. The forecast growth is equivalent to a 5.1% increase in physician demand per 100,000 population in the state.

Expanded Insurance Environment

- Demand Scenario 1 (Baseline) forecast physician demand under the assumption that rates of health care use remain constant over time by applying these rates to the projected future population of the state. Under this scenario, physician demand would increase from 90,470 in 2002 to 119,847 in 2015 (a 33% increase). The forecast growth is equivalent to an 11.9% increase in the physician demand per 100,000 population in the state.

- Demand Scenario 2 (Economic Expansion) explicitly accounted for the positive relationship between economic growth and physician demand. The scenario forecast physician demand under the assumptions that California's per capita gross state product increases by 1% annually and that demand for physicians increases by 0.75% annually for every 1% annual growth in the per capita gross state product. Under this scenario, physician demand would increase from 90,470 in 2002 to 131,200 in 2015 (a 45% increase). The forecast growth is equivalent to a 22.5% increase in the physician demand per 100,000 population in the state. It should be noted that the relationship modeled in demand scenario 3 is not controlled for in this scenario.

- Demand Scenario 3 (Changing Age-Specific Physician Utilization Rates) forecast physician demand under the assumption that the age-specific physician utilization rates in the state would change in the same way between 2002 and 2015 as has been observed nationally between 1990 and 2000. Under this scenario, physician demand would increase from 90,470 in 2002 to 126,636 in 2015 (a 40% increase). The forecast growth is equivalent to an 18.3% increase in the physician demand per 100,000 population in the state. It should be noted that the relationship modeled in demand scenario 3 is not controlled for in this scenario.

- Demand Scenario 4 (Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the assumption that 5% of the services provided by physicians are unnecessary/ marginally beneficial and that those services would be eliminated by 2015. Under this scenario, physician demand would increase from 90,147 in 2002 to 113,855 in 2015 (a 26% increase). The forecast growth is equivalent to a 6.7% increase in the physician demand per 100,000 population in the state.

- Demand Scenario 5 (Economic Expansion and Unnecessary/Marginally Beneficial Services Elimination) forecast physician demand under the combined assumptions of demand scenarios 2 and 4. Under this scenario, physician demand would increase from 90,147 in 2002 to 124,640 in 2015 (a 38% increase). The forecast growth is equivalent to a 16.8% increase in physician demand per 100,000 population in the state.

- Demand Scenario 6 (Changing Age-Specific Physician Utilization Rates and Unnecessary/ Marginally Beneficial Services Elimination) forecast physician demand under the combined assumptions of demand scenarios 3 and 4. Under this scenario, physician demand would increase from 90,147 in 2002 to 120,304 in 2015 (a 34%) increase. The forecast growth is equivalent to a 12.8% increase in physician demand per 100,000 population in the state.

Table 5-19

Projected Growth in Demand for Physicians per 100,000 Population in California, 2002-2015

	Constant Insurance Environment	Expanded Insurance Environment	
Demand	**% Growth**	**% Growth**	**Scenario Description**
Scenario 1	2.2%	11.9%	Baseline (*Demand Scenario 1*)
Scenario 2	11.9%	22.5%	Economic Expansion (*Demand Scenario 2*)
Scenario 3	10.3%	18.3%	Age-specific Physician Utilization Rate Changes (*Demand Scenario 3*)
Scenario 4	-2.5%	6.7%	Unnecessary/Marginally Beneficial Services Eliminated (*Demand Scenario 4*)
Scenario 5	6.7%	16.8%	Economic Expansion + Unnecessary/Marginally Beneficial Services Eliminated (*Demand Scenario 5*)
Scenario 6	5.1%	12.8%	Age-specific Physician Utilization Rate Changes + Unnecessary/Marginally Beneficial Services Eliminated (*Demand Scenario 6*)

Physician Supply

- Supply Scenario 1 (Baseline) forecast physician supply under the assumption patterns of physician production, separation and migration remain constant over time. Under this scenario, physician supply would increase from 90,470 in 2002 to 107,464 in 2015 (a 19% increase). The forecast growth is equivalent to a 0.4% increase in the physician supply per 100,000 population in the state.

- Supply Scenario 2 (Lifestyle Changes) forecast physician supply under the assumption that physicians would reduce the number of hours they spend in practice by 10% by 2015. Under this scenario, physician supply would increase from 90,470 in 2002 to 101,013 in 2015 (a 12% increase). The forecast growth is equivalent, in this case, to a 5.7% decrease in the physician supply per 100,000 population in the state.

- Supply Scenario 3 (Productivity Enhancements) forecast physician supply under the assumption that physician productivity would increase by 5% by 2015. Under this scenario, physician supply would increase from 90,470 in 2002 to 113,017 in 2015 (a 25% increase). The forecast growth is equivalent to a 5.6% increase in the physician supply per 100,000 population in the state.

- Supply Scenario 4 (Lifestyle Changes and Productivity Enhancements) forecast physician supply under the combined assumptions of supply scenarios 2 and 3. Under this scenario, physician supply would increase from 90,470 in 2002 to 105,904 in 2015 (a 17% increase). The forecast growth is equivalent, in this case, to a 1.1% decrease in the physician supply per 100,000 population in the state.

Table 5-20

Projected Growth in Supply of Physicians per 100,000 Population in California, 2002-2015

Supply	% Growth	Scenario Description
Scenario 1	0.4%	Baseline (*Supply Scenario 1*)
Scenario 2	-5.7%	10% Reduction in Work Hours (*Supply Scenario 2*)
Scenario 3	5.6%	5% Increase in Productivity (*Supply Scenario 3*)
Scenario 4	-1.1%	10% Reduction in Work Hours and 5% Increase in Productivity (*Supply Scenario 4*)

Under each supply scenario, the average (mean) difference between growth in demand per 100,000 population and growth in supply per 100,000 through 2015 is positive, indicating that demand is forecast to grow more rapidly than supply during the period. By 2015, physician demand per 100,000 population is projected to have grown between 4.7% and 15.9% more than physician supply per 100,000 population in the state. Thus, California is likely to face a physician shortage in 2015. In terms of numbers of physicians, the shortage is projected to range between 4,961 and 16,985 physicians, or between 12 and 40 physicians per 100,000 population in 2015.

Table 5-21

Mean Percentage Difference between Projected Growth in Demand for and Projected Growth in Supply of Physicians per 100,000 Population in California by Supply Scenario, 2002-2015*

Supply	Mean Difference Demand Growth per 100,000 Population relative to Supply Growth per 100,000 Population	Scenario Description
Scenario 1	9.8%	Baseline (*Supply Scenario 1*)
Scenario 2	15.9%	10% Reduction in Work Hours (*Supply Scenario 2*)
Scenario 3	4.7%	5% Increase in Productivity (*Supply Scenario 3*)
Scenario 4	11.3%	10% Reduction in Work Hours and 5% Increase in Productivity (*Supply Scenario 4*)

** Calculated as Σ(Percentage Demand Growth$_{ij}$ - Percentage Supply Growth$_k$)/(N)|Supply$_k$, where i = insurance environment, j = demand scenario, k = supply scenario, and N=12 (2 insurance environments * 6 demand scenarios);[14] positive differences indicate demand growing faster than supply (i.e., a physician shortage).*

[14] For example, for supply scenario 1, the mean difference is calculated as [(2.2%-0.4%) + (11.9%-0.4%) + (10.3%-0.4%) + (-2.5%-0.4%) + (6.7%-0.4%) + (5.1%-0.4%) + (11.9%-0.4%) + (22.5%-0.4%) + (18.3%-0.4%) + (6.7%-0.4%) + (16.8%-0.4%) + (12.8%-0.4%)]/12 = 9.8%. A detailed table that includes all of the calculated differences between projected supply and demand in 2015 can be found in Table A-2 in the Appendix.

OPTIONS FOR PROMOTING A BALANCE OF PHYSICIAN SUPPLY AND DEMAND IN 2015

The assessment of the supply and demand for physicians in California in 2015 indicates that the state is likely to face an overall shortage of physicians in the range of 5% to 16%. In addition, there are some communities likely to experience more serious shortages than other areas. There are a number of strategies to be considered to address these shortages and mal-distribution of physicians. The following is a brief description of some of these options.

1. Strategies to Increase the Supply of Physicians in California

- *Increase medical school capacity*: Given the projected population growth in the state and the low ratio of medical school enrollment to population, consideration could be given to increasing medical school capacity in the state. This might be targeted to communities and population groups that are expected to grow significantly or who already face shortages.

- *Increase GME capacity*: Quality training programs can attract physicians from around the country, including those originally from California, to come to California from other parts of the nation. While adding GME training positions in teaching hospitals can be less costly than medical school expansion, the current federal ceiling on Medicare GME reimbursement has discouraged many teaching hospitals from adding training positions. If programs do expand, they might be targeted to communities facing shortages in the state.

- *Incentives to encourage physicians to migrate to California to practice*: Historically, many physicians educated and trained elsewhere have migrated to California. While the state faces competition from other states and regions growing more rapidly, it may be possible to design programs to market medical practice in the state to physicians in other states. To the extent that physicians in the state are unhappy with the practice environment, it can be difficult marketing medical practice in the state.

- *Incentives to keep physicians in practice:* While physician practice patterns, including hours of practice and patterns of retirement are difficult to track and document, encouraging physicians to practice more hours or to delay retirement can increase the supply. Efforts to address physician concerns (e.g., medical liability; barriers to part-time practice. etc.) could increase the supply of physicians. These efforts could be done in collaboration with professional groups and provider associations.

2. ***Increase Productivity and Capacity of Existing Physician Workforce***

- *Expand the supply and use of non-physician clinicians, including NPs, PAs, and midwives*: Non-physician clinicians have demonstrated their ability to provide beneficial services by working with physicians. Greater use of these clinicians would reduce the number of new physicians required in the future.

- *Invest and support new technologies, such as information systems, that improve efficiency and effectiveness*: This approach can improve health outcomes and quality of care as well as reducing the number of new physicians that will be required in the future.

- *Increase the use of treatment protocols and utilization review*: This is another strategy that can improve quality and reduce demand for physicians.

3. ***Increase Diversity of Physician Workforce***

- *Promote programs that increase diversity, such as educational enrichment, and support programs for the economically disadvantaged and under-represented minorities*. In light of the increasing diversity of the California population, it is necessary that existing efforts (e.g., Health Professions Career Opportunity Program administered by the Office of Statewide Health Planning and Development) be expanded and new efforts be made to bring populations currently under-represented into medicine. This will have numerous other benefits to the residents of the state.

4. ***Promote a More Effective Marketplace for Physician Workforce Planning and Policies***

- *Increase data collection and tracking of need for physician services*.

- *Develop systems to track physician supply and requirements and undertake a comprehensive re-assessment of physician supply and requirements every five years*.

- *Establish an overall statewide process for physician workforce planning by strengthening and supporting the Office of Statewide Health Planning and Development (OSHPD) and the Center for California Health Workforce Studies and other stakeholders around the state*.

5. ***Programs and Policies to Address Physician Mal-Distribution by Region and Specialty***

- *Ongoing assessment, identification and publication of shortage areas by specialty*: An annual or biennial publication of a fact-based report from the state of California identifying its physician requirements by region and specialty could influence the physician distribution at a relatively low cost and in a non-regulatory manner. This effort should also be linked to directly seeking or providing the data for others to seek federal designation of HPSAs (typically initiated at the local level), thus making the areas eligible for a number of federal programs including the National Health Service Corps and higher Medicare reimbursement.

- *Physician placement program*: A step beyond the publication of areas and specialties in need is the development of placement programs (e.g., Shortage Area Medical Education & Training Program administered by OSHPD) that would identify specific practice opportunities. These would be of service to organizations and communities searching for a physician as well as physicians seeking positions. The placement activities could be limited to areas with documented physician deficits.

- *Physician loan-repayment*: These programs (e.g., State Loan Repayment Program administered by OSHPD) help physicians repay their educational loans if they practice in selected areas and/or in selected specialties that have been identified or designated as insufficiently supplied. A benefit of this approach is that the funds spent can be carefully targeted to meet priority needs. A disadvantage is that not all physicians have significant outstanding debt and it does not help economically disadvantaged individuals access medical school.

- *Medical School Scholarships with service obligations*: This can both encourage physicians to practice in underserved areas and specialties and help the economically-disadvantaged access medical education. A disadvantage is that such a program can be difficult to administer given the gap from an initial award to the time of practice in a shortage area/specialty, perhaps as long as 10 to 15 years later.

- *Targeted site development grants*: It is far easier to attract a physician to an area if there is an organizational structure in which to practice in the area. This has been a major federal strategy in their support for community health centers (CHCs). By providing grants for new sites or expansion of existing sites, the responsibility is on the organization to recruit new physicians. There is growing evidence that newer physicians prefer to work regular hours and within an organization that handles the many details of modern medical practice. Support for the practice structure in priority areas can be very effective.

- *Education and training in underserved or rapidly growing areas*: If the goal is to encourage a significant number of physicians to locate in a particular region, then consideration should be given to strategies to locate education and training in that area. For example, it is well documented that location of residency training is a major determinant of initial practice location for new physicians. The expansion of medical education in an area also offers teaching opportunities and faculty positions for existing physicians in the area which can contribute to retention in the area and to improving the quality of care. Three possibilities include:

    - Development of a clinical campus (3rd and 4th years of medical school) in a region;
    - Location of residency programs; and
    - Rotations for medical students and residents.

- *Selection of medical students from underserved areas*: Another educational strategy is to recruit medical students from rural or other underserved areas as they are more likely to return to those areas to practice once they complete their medical education and training.

- *Higher reimbursement in shortage areas*: Medicare provides increased reimbursement for physicians practicing in HPSAs. While this may be more effective for smaller geographic areas, it might be possible to use MediCal and private insurance policies to provide economic incentives to physicians to practice in areas of high need in the state.

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APPENDIX

Table A-1

County Composition of California Regions Used in Report

Region	Counties Included:
Bay Area (BA)	Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma
Central Coast (CC)	Monterey, San Benito, San Luis Obispo, Santa Barbara, Ventura
Central Valley/Sierra (CVS)	Alpine, Calaveras, Mono, San Joaquin, Stanislaus, Tuolumne
Inland Empire (IE)	Riverside, San Bernadino
Los Angeles (LA)	Los Angeles
North Valley/Sierra (NVS)	Amador, Colusa, El Dorado, Nevada, Placer, Sacramento, Sierra, Sutter, Yolo, Yuba
Northern California (NC)	Butte, Del Norte, Glenn, Humboldt, Lake, Lassen, Mendocino, Modoc, Plumas, Shasta, Siskiyou, Tehama, Trinity
Orange County (O)	Orange
San Diego (SD)	San Diego, Imperial
South Valley/Sierra (SVS)	Fresno, Kings, Madera, Mariposa, Merced, Tulare, Inyo, Kern

Table A-2

Percentage Difference between Projected Physician Supply Growth and Projected Physician Demand Growth per 100,000 Population through 2015 by Insurance Environment*

Constant Insurance Environment	Supply Scenarios			
Demand Scenarios	**1**	**2**	**3**	**4**
1	1.8%	7.9%	-3.4%	3.3%
2	11.5%	17.6%	6.3%	13.0%
3	9.9%	16.0%	4.7%	11.4%
4	-2.9%	3.2%	-8.1%	-1.4%
5	6.3%	12.4%	1.1%	7.8%
6	4.7%	10.8%	-0.4%	6.2%

Expanded Insurance Environment	Supply Scenarios			
Demand Scenarios	**1**	**2**	**3**	**4**
1	11.5%	17.6%	6.3%	13.0%
2	22.1%	28.2%	16.9%	22.7%
3	17.9%	24.0%	12.7%	21.0%
4	6.3%	12.4%	1.2%	6.6%
5	16.4%	22.5%	11.3%	16.8%
6	12.4%	18.5%	7.2%	12.8%
Mean Difference	*9.8%*	*15.9%*	*4.7%*	*11.1%*

** Calculated as: Projected Demand Growth per 100,000 population minus Projected Supply Growth per 100,000 population. Positive numbers indicate physician deficits; negative numbers indicate physician surpluses.*

Table A-3

Absolute Difference between Projected Physician Supply Growth and Projected Physician Demand Growth through 2015 by Insurance Environment*

Constant Insurance Environment	Supply Scenarios			
Demand Scenarios	**1**	**2**	**3**	**4**
1	1,997	8,448	-3,556	3,557
2	12,366	18,817	6,813	13,926
3	10,588	17,039	5,035	12,148
4	-3,153	3,298	-8,706	-1,593
5	6,698	13,149	1,145	8,258
6	5,008	11,459	-545	6,568

Expanded Insurance Environment	Supply Scenarios			
Demand Scenarios	**1**	**2**	**3**	**4**
1	12,383	18,834	6,830	13,943
2	23,736	30,187	18,183	25,296
3	19,172	25,623	13,619	20,732
4	6,714	13,165	1,161	8,274
5	17,499	23,950	11,946	19,059
6	13,163	19,614	7,610	14,723
Mean Difference	*10,514*	*16,965*	*4,961*	*12,074*

** Calculated as: Projected Demand Growth minus Projected Supply Growth. Positive numbers indicate physician deficits; negative numbers indicate physician surpluses.*

Table A-4

Absolute Difference between Projected Physician Supply Growth per 100,000 Population and Projected Physician Demand Growth per 100,000 Population through 2015 by Insurance Environment*

Constant Insurance Environment	Supply Scenarios			
Demand Scenarios	**1**	**2**	**3**	**4**
1	4.7	19.9	-8.4	8.4
2	29.2	44.4	16.1	32.9
3	25.0	40.2	11.9	28.7
4	-7.3	7.9	-20.4	-3.6
5	16.0	31.2	2.9	19.7
6	12.0	27.2	-1.1	15.7

Expanded Insurance Environment	Supply Scenarios			
Demand Scenarios	**1**	**2**	**3**	**4**
1	29.3	44.5	16.2	33.0
2	56.0	71.2	42.9	59.7
3	45.3	60.5	32.2	49.0
4	16.0	31.2	2.9	19.7
5	41.5	56.7	28.4	45.2
6	31.2	46.4	18.1	34.9
Mean Difference	*24.9*	*40.1*	*11.8*	*28.6*

** Calculated as: Projected Demand Growth per 100,000 population minus Projected Supply Growth per 100,000 population. Positive numbers indicate physician deficits; negative numbers indicate physician surpluses.*

Table A-5

Demand Scenarios Used in Report

Demand	Description
Scenario 1	Baseline
Scenario 2	Economic Expansion
Scenario 3	Age-specific Physician Utilization Rate Changes
Scenario 4	Unnecessary/Marginally Beneficial Services Eliminated
Scenario 5	Economic Expansion + Unnecessary/Marginally Beneficial Services Eliminated
Scenario 6	Age-specific Physician Utilization Rate Changes + Unnecessary/Marginally Beneficial Services Eliminated

Table A-6

Supply Scenarios Used in Report

Supply	Description
Scenario 1	Baseline
Scenario 2	10% Reduction in Work Hours
Scenario 3	5% Increase in Productivity
Scenario 4	10% Reduction in Work Hours and 5% Increase in Productivity