

Is There A Doctor in the House?
An Examination of the Physician Workforce in California
Over the Past 25 Years

Janet Coffman – Petris Center Research Associate
Brian Quinn – Petris Center Research Associate
Timothy Brown – Associate Director of Research, Petris Center*
Richard Scheffler – Director of the Petris Center/Distinguished
Professor of Health Economics & Public Policy

Nicholas C. Petris Center on Health Care Markets and Consumer Welfare
University of California, Berkeley
Berkeley, California

June 2004

* Corresponding Author

* Corresponding Author:
Timothy T. Brown, PhD
Associate Director of Research
Petrís Center on Health Care Markets and Consumer Welfare
2150 Shattuck Avenue, Suite 525
Berkeley, CA 94720-7380
Ph: 510-643-4100
Fx: 510-643-4281
Em: tbpetris@berkeley.edu
www.petrís.org

Copyright © 2004 Nicholas C. Petris Center on Health Care Markets
And Consumer Welfare, University of California, Berkeley
All Rights Reserved.

American Medical Association Physician Masterfile,
Copyright © 2003 American Medical Association
All Rights Reserved.

FROM THE DIRECTOR

Physicians play a critical role in California's health care system. Experts disagree as to whether California is facing a physician workforce crisis. To inform this discussion, the Petris Center has undertaken a comprehensive examination of long-run trends in California's physician workforce from 1978 to 2002. We address the following questions: Does the state have a sufficient number of physicians? Are physicians adequately distributed with respect to specialty and geographic location? And are physicians meeting the needs of California's racially/ethnically diverse population? We also examine nurse practitioners and physician assistants, whose scopes of practice increasingly overlap with those of physicians. We find that the number of active physicians and the physician-to-population ratio in California have both increased over the past 25 years. However, the numbers of physicians in some specialties have not kept pace with the growth in population. Data on physicians' incomes suggest that California has ample numbers of generalists but may be experiencing modest shortages of physicians in some specialties. In addition, the state's physician supply is aging rapidly. Many physicians will be retiring over the next decade, which may lead to future shortages of physicians. California's physicians are also not adequately distributed across the state, with rural areas being particularly vulnerable to physician shortages. Although the state's physicians are becoming more racially/ethnically diverse, there are still disproportionately low numbers of Hispanic and Black physicians in California. The state's nurse practitioner and physician assistant workforces have increased dramatically in recent years and have grown in importance. These nonphysician clinicians help to improve access to health care in underserved areas across California.

This report is funded solely by the Petris Center. The Petris Center conducts economic and policy research to help consumers, consumer-advocates, health care providers, regulators and policymakers understand today's complex health care market. The Center seeks to provide up-to-date and objective information on changes in the health care system that may impact the health care marketplace and alter its capacity to provide high-quality care at competitive prices. The Center assesses issues related to the welfare of California consumers, including affordability, availability and access to health care with a particular focus on low and moderate-income consumers. It also concerns itself with the role of consumer choice and the participation of front-line workers in the health care delivery system.



Richard M. Scheffler, PhD, Director
Distinguished Professor of Health Economics & Public Policy

ACKNOWLEDGMENTS

We are grateful to the following individuals for their helpful comments and thoughtful suggestions.

Michael Drake, MD, *Vice President for Health Affairs, University of California Office of the President*

Tracey Fremd, NP, *President, California Association of Nurse Practitioners*

Kevin Grumbach, MD, *Chair, Department of Family and Community Medicine and Director of the UCSF Center for California Health Workforce Studies*

Jack Lewin, MD, *CEO and Executive Vice President, California Medical Association*

Bob Miller, PA-C, *President of the California Academy of Physician Assistants, Assistant Professor of Clinical Pediatrics and Family Medicine, USC Keck School of Medicine*

Cathryn Nation, MD, *Director of Academic Health Sciences and Academic Geriatric Resources Program, University of California, Office of the President*

Stephen Shortell, PhD, *Dean and Blue Cross of California Distinguished Professor of Health Policy and Management, School of Public Health, University of California, Berkeley*

Mark Smith, MD, MBA, *President and CEO of the California HealthCare Foundation*

We are also grateful to Paul Kirby of the Petris Center for his editorial assistance and to Beth Mertz at UCSF for her help on the construction and design of the maps used in the report. The views expressed in this report are those of the authors and do not necessarily reflect the views of the reviewers or the University of California.

PETRIS CENTER BOARD MEMBERS

Tangerine Brigham, *Health Consultant*

Paul Feldstein, PhD, *Robert Gumbiner Professor of Health Care Management,
University of California, Irvine*

Kathleen Foote, JD, *Acting Senior Assistant Attorney General, Antitrust Section,
California Department of Justice*

H.E. Frech III, PhD, *Professor of Economics, University of California, Santa Barbara*

Deborah Haas-Wilson, PhD, *Professor of Economics, Smith College*

Sherry Hirota, *Executive Director, Asian Health Services, Oakland, California*

Patrick Johnston, *Former California State Senator, Stockton, California*

Bill Lockyer (ex-officio member), *Attorney General, State of California*

Eliseo Medina, *Executive Vice President, Western Region, Service Employees
International Union*

Lourdés Rivera, JD, *Staff Attorney National Health Law Program, Los Angeles,
California*

Richard M. Scheffler, *Distinguished Professor of Health Economics & Public Policy,
University of California, Berkeley*

Stephen Shortell, PhD, *Dean and Blue Cross of California Distinguished Professor of
Health, Policy and Management, School of Public Health, University of California,
Berkeley*

Harry M. Snyder, JD, *Consumer Advocate, The Presidio, San Francisco, California*

PETRIS CENTER RESEARCHERS AND STAFF

Timothy T. Brown, PhD, *Associate Director of Research*
Helen Citkina, PhD, *AHRQ Post-Doctoral Trainee*
Janet Coffman, MA, MPP, *AHRQ Pre-Doctoral Trainee*
Daniel Eisenberg, PhD, *NIMH Post-Doctoral Trainee*
Seana Kelly, BA, *Administrative Assistant*
Paul Kirby, MA, *Project Coordinator*
Lisa Simonson Maiuro, MSPH, PhD, *Consultant*
Claudia Martinez, MPH, *Grants Administrator*
Vikram Panthania, MBA, *Graduate Student Researcher*
Brian Quinn, BA, *AHRQ Pre-Doctoral Trainee*
Mary Reed, MPH, *Graduate Student Researcher*
James F. Ross, MBA, *Manager, Finance and Administration*
Sukyong Seo, MPH, *Graduate Student Researcher*
Nicole Starkweather, MHSA, *Graduate Student Researcher*
Debra Waterstone, MPP, *Graduate Student Researcher*

PETRIS CENTER AFFILIATED FACULTY

Gladys Block, PhD, *Professor of Epidemiology and Public Health Nutrition, University of California, Berkeley*
Farasat Bokhari, PhD, *Assistant Professor of Economics, Florida State University*
Ying Qing Chen, PhD, *Assistant Professor of Epidemiology and Public Health Nutrition, University of California, Berkeley*
Teh-wei Hu, PhD, *Professor of Health Economics, University of California, Berkeley*
Carlos Iribarren MD, MPH, PhD, *Research Scientist, Kaiser Permanente*
Ichiro Kawachi, MD, PhD, *Professor of Health and Social Behavior, Harvard University*

Rick Mayes, PhD, *Assistant Professor of Public Policy, University of Richmond*

Douglas Miller, PhD, *Assistant Professor of Economics, University of California, Davis*

Zak Sabry, PhD, *Professor of Public Health Nutrition, University of California, Berkeley*

John E. Schneider, PhD, *Assistant Professor of Health Management and Policy,
University of Iowa*

Douglas Schwalm, PhD, *Assistant Professor of Economics, Louisiana State University*

Richard Smith, PhD, *Assistant Professor, College of Business, University of South
Florida*

Joanne Spetz, PhD, *Assistant Adjunct Professor, Community Health Systems, University
of California, San Francisco*

S. Leonard Syme, PhD, *Professor of Epidemiology, University of California, Berkeley*

CONTENTS

EXECUTIVE SUMMARY.....	xiii
INTRODUCTION.....	1
CHAPTER 1: Does California Have Enough Physicians?.....	3
CHAPTER 2: Does California Have a Shortage of Specialists?.....	21
CHAPTER 3: Are California Doctors Where We Need Them?.....	32
CHAPTER 4: Do California's Physicians Reflect its Population?.....	51
CHAPTER 5: What is the Impact of Nonphysician Clinicians in California?.....	63
CHAPTER 6: Where Do We Go From Here?.....	75
WORKS CITED.....	82
APPENDIX A: Data Sources.....	90
APPENDIX B: Physicians and Physician Ratios by County, 2002.....	94
APPENDIX C: Comparison of Active Patient Care and Licensed Physicians.....	97
APPENDIX D: Primary Care HPSAs in California.....	100

TABLES

TABLE 2.1: California and U.S. Physician Incomes, 1995-1999.....	28
TABLE 3.1: California Counties with the 10 Highest Ratios of Patient Care Physicians per 100,000 Persons.....	38
TABLE 3.2: California Counties with the 10 Lowest Ratios of Patient Care Physicians per 100,000 Persons.....	38
TABLE 5.1: Licensed Nurse Practitioners and Physician Assistants in California by County, 2002: Totals and Ratios Per 100,000 Population.....	66-67
TABLE 5.2: Adding NPs and PAs to Provider-to-Population Ratios in California by County, 2002.....	68-69
TABLE 5.3: Primary Employer of U.S. Physician Assistants and Nurse Practitioners, 2000.....	72
TABLE 5.4: Primary Specialty Practiced by U.S. Physician Assistants, 2000.....	73

FIGURES

FIGURE 1.1: Number of Physicians in California, 2002.....	4
FIGURE 1.2: Number of Physicians in California, 1978-2002.....	6
FIGURE 1.3: Ratio of Physicians to Population in California, 1978-2002.....	7
FIGURE 1.4: Trends in the Percentage of California Physicians by Major Specialty Area, 1978-2002.....	8
FIGURE 1.5: Percentages of Active and Inactive Physicians in California, Select Years.....	9
FIGURE 1.6: Active Patient Care Physicians in California by Age Group, 1978-2002.....	10
FIGURE 1.7: Patient Care Physicians Per 100,000 Population, 1980-2001.....	11
FIGURE 1.8: Ratio of Active Patient Care Physicians to Population In California, 1978-2002.....	13
FIGURE 1.9: Real Incomes of California and U.S. Physicians, 1983-1998.....	16
FIGURE 1.10: Percent Change in Health Services Portion of Gross State Product, California.....	17
FIGURE 2.1: Active Patient Care Physicians in California, 1978-2002.....	22
FIGURE 2.2: Physician-to-Population Ratios for Active Patient Care Physicians, 1978-2002.....	23

FIGURE 2.3: Active Patient Care Specialists by Major Specialty Group, 1978-2002.....	24
FIGURE 2.4: Physician-to-Population Ratios for Active Patient Care Physicians, 1978-2002.....	25
FIGURE 2.5: Ratios of Patient Care Specialists to Population, California and Other States, 1995-2001.....	26
FIGURE 2.6: Physician-to-Population Ratio for Active Patient-Care Physicians in California, 1978-2002.....	27
FIGURE 3.1: Active, Patient Care Physician-to-Population Ratios in California Counties (Map), 2002.....	34
FIGURE 3.2: Active, Patient Care Generalist Physician-to-Population Ratios in California Counties (Map), 2002.....	35
FIGURE 3.3: Active, Patient Care Specialist Physician-to-Population Ratios in California Counties (Map), 2002.....	36
FIGURE 3.4: Patient Care Physician-to-Population Ratios in California Counties with High and Low HMO Penetration, 1997-2002.....	40
FIGURE 3.5: HMO Penetration Rates in Metropolitan and Non-Metropolitan Counties in California, 1997-2002.....	41
FIGURE 3.6: Physician-to-Population Ratios for Active Patient Care Physicians in Metropolitan and Non-Metropolitan Counties in California, 1997-2002.....	42
FIGURE 3.7: Physician-to-Population Ratios for Active Patient Care Generalists in Metropolitan and Non-Metropolitan Counties in California, 1997-2002.....	43

FIGURE 3.8: Physician-to-Population Ratios for Active Patient Care Specialists in Metropolitan and Non-Metropolitan Counties in California, 1997-2002.....	43
FIGURE 3.9: Physician-to-Population Ratios for Physicians in California by Per Capita Income, 1997-2002.....	45
FIGURE 3.10: Patient Care Physician-to-Population Ratio for Counties in California by Hispanic Population, 1997-2002.....	46
FIGURE 3.11: Generalist Physician-to-Population Ratio for Counties in California by Hispanic Population, 1997-2002.....	47
FIGURE 4.1: Race and Ethnicity of California’s Population, 1978-2002.....	53
FIGURE 4.2: Comparison of the Race and Ethnicity of California’s Population and its Active Patient Care Physicians, 2002.....	54
FIGURE 4.3: Race and Ethnicity of California’s Active Patient Care Physicians by Major Specialty Group, 2002.....	55
FIGURE 4.4: Race and Ethnicity of California’s Active Patient Care Physicians by Age Group, 2002.....	56
FIGURE 4.5: Race and Ethnicity of California’s Medical Residents, 2002.....	57
FIGURE 4.6: Race and Ethnicity of Graduates of California Medical Schools, 2001.....	58
FIGURE 4.7: Race and Ethnicity of Graduates of U.S. Medical Schools, 1992-2001.....	59
FIGURE 5.1: Physician Assistants and Nurse Practitioners, 1996 and 2000.....	65

FIGURE 5.2: Proportion of Physician Assistants and Nurse Practitioners by Gender, 2000.....	70
--	----

FIGURE 5.3: Proportion of Physician Assistants and Nurse Practitioners by Race, 2000.....	71
--	----

EXECUTIVE SUMMARY

Physicians are a key component of California's health care system. Their contributions to the diagnosis and treatment of illness are critical to the well-being of the state's population. California's citizens and its policymakers need to know how the state's physicians have responded to the dramatic changes in health care in the United States over the past 25 years. This report, prepared by the Petris Center on Health Care Markets and Consumer Welfare, presents important new findings about long-range trends in physician supply in California, as well as a snapshot of the state's current physician workforce. Most of our data are from the American Medical Association's Masterfile, the most comprehensive and systematic source of data regarding physician practice in the United States. The report addresses vital issues such as whether the state has a sufficient number of physicians, whether physicians are adequately distributed with respect to specialty and geographic location, the extent to which they are meeting the needs of the state's racially/ethnically diverse population, and the growing importance of nurse practitioners and physician assistants.

Major Findings

We report several new and important findings about the physician workforce in California:

Statewide Trends in the Number of Physicians

- Despite anecdotal reports that the number of physicians in California is declining, the number of active patient care physicians has actually increased by 82% since the late 1970s.
- The statewide physician-to-population ratio has increased by approximately 25% over the past 25 years.
- California's physician-to-population ratio is slightly larger than the average in the rest of the country, but has moved downward towards the national average over the last decade.
- The number of active patient care physicians aged 66 or older has tripled since the late 1970s, and the number aged 56 to 65 has doubled. In contrast, the number of active patient care physicians aged 40 or younger has decreased since the early 1990s.

California could face a shortage of physicians in the future unless retirements are offset by an increase in the number of young physicians.

Statewide Trends in the Number of Specialists

- Statewide ratios of active patient care physicians to population have increased since 1978 for generalists, hospital-based specialists, and medical specialists. The ratios of obstetrician/gynecologists and psychiatrists have remained stable. The ratio of surgical specialists to population has decreased over the past 25 years, because the population has grown more rapidly than the number of surgeons.
- During the mid to late 1990s, the incomes of generalist physicians and some specialists decreased, a finding that implies California has abundant supplies of these physicians. In contrast, incomes of psychiatrists, medical specialists, and surgical specialists increased slightly, suggesting that California may have modest shortages of these physicians.

Geographic Distribution of Physicians

- California's physicians are not adequately distributed across the state. Over the past 25 years, some counties have consistently had abundant supplies of physicians, whereas others have had persistent shortages.
- Non-metropolitan counties and counties with low per capita income have low ratios of physicians to population.
- Counties with high Hispanic populations have a low supply of generalist physicians.
- We find no evidence that health maintenance organizations (HMOs) are driving physicians out of California or into retirement.

Racial/Ethnic Distribution of California Physicians

- Although the state's physicians are slowly becoming more racially/ethnically diverse, Blacks and Hispanics remain underrepresented among California's physicians.

Non-Physician Clinicians in California

- The number of nurse practitioners and physician assistants in California has increased rapidly in recent years. These professions complement specialist physicians and substitute for generalist physicians in the delivery of routine primary care. They are especially important resources in areas of California that do not have adequate numbers of physicians.

Policy Recommendations

Our findings suggest the following recommendations for policymakers:

Geographic Distribution of Physicians

- While the evidence does not suggest a need to significantly increase the overall supply of physicians in California, the distribution of physicians in the state would be improved by modestly increasing medical school and residency enrollment for the primary purpose of preparing physicians to meet the needs of underserved populations and communities.
- Policymakers should continue to support policies and programs aimed at increasing access to medical care in communities with an inadequate number of physicians. For example, California could recruit more medical students and medical residents from underserved areas, provide more training in these areas, and expand loan repayment programs for physicians who practice in these areas.
- Expanding health insurance coverage could also help alleviate physician shortages in underserved areas by increasing residents' ability to pay for physician services.

Racial/Ethnic Distribution of California Physicians

- Policymakers should provide more funding for outreach and scholarship programs designed to increase the racial/ethnic diversity of the state's physician medical students and residents.
- Policymakers should ensure that physicians educated in California have the linguistic and cultural competencies required to meet the health care needs of the state's racially/ethnically diverse population.

Non-Physician Clinicians in California

- Finally, policymakers should support alternatives to traditional doctor-patient visits that can improve the efficiency and effectiveness of medical care. Options include expanding the use of physician assistants and nurse practitioners, as well as the use of information technologies, such as the Internet, electronic mail, and telemedicine. These tools may allow the state to maximize the efficiency and effectiveness of medical care.

Research Recommendations

Our findings suggest the following recommendations for future research:

- California policymakers should closely monitor physician supply and the demand for medical care in the state. Two issues that warrant particular attention are the

decreasing number of young physicians in the state and the lack of growth in the number of surgical specialists.

- State officials should provide the California Medical Board with sufficient resources to complete periodic surveys of California's licensed physicians. These surveys should encompass demographic information as well as indicators of supply and demand for physicians, such as the number of hours that physicians work and their incomes.
- Policymakers should also fund studies of factors that affect the demand for physicians, such as trends in population demographics, burden of disease, advances in biomedical science, and the financing and delivery of health care services.
- Studies of supply and demand for physicians should assess trends in major physician specialties as well as overall trends so that policymakers can determine whether shortages exist in certain specialties.

INTRODUCTION

California's health care system has changed dramatically over the past 25 years. The development of managed care, the growth of physician groups, hospital mergers, and new biomedical technologies have revolutionized the ways in which health services are provided. Demand for medical care has also increased. California's population has grown rapidly, and is now composed of a larger proportion of senior citizens. The state has also become much more racially/ethnically diverse. These demographic shifts have created new pressures on the health care system. The doctor-patient relationship is also changing because many patients are better informed and are now demanding a larger role in treatment decisions (Guadagnoli and Ward 1998).

Policymakers need to know how California's physicians have responded to these changes in health care financing and delivery. In particular, policymakers need to know whether California has a sufficient number of physicians, whether physicians are adequately distributed with respect to specialty and geographic location, and the extent to which they are meeting the needs of the state's racially/ethnically diverse population. Such information can help policymakers develop sound policies regarding medical education, physician licensure, malpractice, reimbursement for physician services, and other health care issues.

This report presents new findings on long-range trends in physician supply in California. Most of the data come from the American Medical Association's Masterfile, the most comprehensive source of longitudinal data regarding physician practice in the United States. The AMA Masterfile has two important advantages over other data sources. First, it permits analysis of longitudinal trends because it is updated annually. Second, it is a national database that can be used to compare California to other states and to the United States overall. We focus primarily on physicians whose major professional activity is patient care, because these physicians directly serve the public and are more likely to be affected by changes in the health care marketplace than physicians engaged in non-patient care activities (such as research or hospital administration).

The report contains six chapters. Chapter 1 describes trends in physician supply in California. Chapter 2 examines the distribution of physicians by specialty, while

Chapter 3 discusses their geographic distribution. Chapter 4 addresses the race/ethnicity of physicians and medical students. Chapter 5 provides information regarding non-physician clinicians, whose scopes of practice increasingly overlap with those of physicians. Chapter 6 summarizes the findings from the preceding chapters and presents recommendations for policymakers. The appendices contain information regarding data sources, references, and additional tables and figures.

CHAPTER 1: DOES CALIFORNIA HAVE ENOUGH PHYSICIANS?

Over the past several years, some health care organizations in California have experienced difficulty recruiting and retaining physicians (California Medical Association 2001). These difficulties need to be analyzed in the context of long-range trends in California's physician supply. In this chapter, we examine data on trends in physician supply in California from 1978 through 2002, to assess whether California has a shortage of physicians. We find that the number of physicians in California has grown dramatically over the past 25 years, but that the ratio of physicians to population has grown more slowly, because California's population grew quite rapidly during this time period. The overall supply of physicians in California appears adequate, and is similar to that of the U.S. overall. However, trends in the age distribution of California's physicians and in demand for medical care suggest that policymakers need to closely monitor supply and demand indicators to avert a physician shortage in the future. Succeeding chapters will address the adequacy of physician supply across specialties, regions, and racial/ethnic groups.

Most of the data presented in this report are from the American Medical Association's (AMA) Masterfile. This database contains records for all physicians in the U.S. who have completed or are enrolled in an allopathic (i.e., MD) residency program. The AMA Masterfile is the most comprehensive source of longitudinal data on U.S. physicians. The inclusion of almost all physicians in the AMA Masterfile permits an analysis of physician supply trends in counties and other sub-state geographic areas that is usually not feasible with sample surveys.

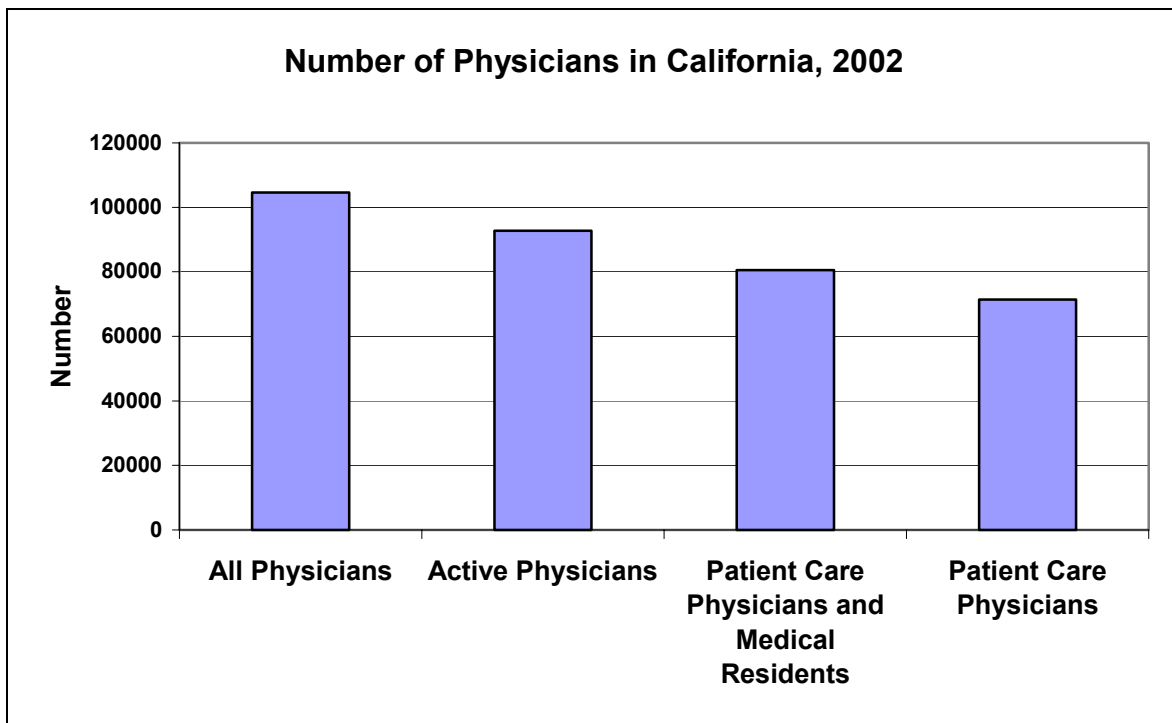
Trends in the Number of Physicians

The supply of physicians in a state, county, or other geographic area can be defined in several ways. The most expansive definition of physician supply encompasses all physicians in a geographic area, regardless of whether they actively practice medicine. The majority of physician workforce studies do not use this definition and instead focus on the number of active physicians, because this measure indicates the number of physicians who actually provide medical services to the public. Patient care physicians

are typically defined as physicians in office-based or hospital-based clinical practice. Some studies include medical residents in counts of patient care physicians, because medical residents provide patient care as part of their training.

As Figure 1.1 indicates, the definition of physician supply has major implications for estimates of the number of physicians in California. In 2002, the most recent year for which data are available, there were approximately 105,000 physicians in California, but only 93,000 were in active practice. Among active physicians, approximately 71,000 reported that their primary professional activity was patient care, while 9,000 were medical residents, and 13,000 were engaged in non-patient care activities, such as administration, teaching, or research.¹

Figure 1.1



Source: Petris Center analysis of the AMA Masterfile.

Consistent with previous studies (Coffman et al. 1996, Dower et al. 2001), we find that the number of physicians in California increased dramatically between 1978 and

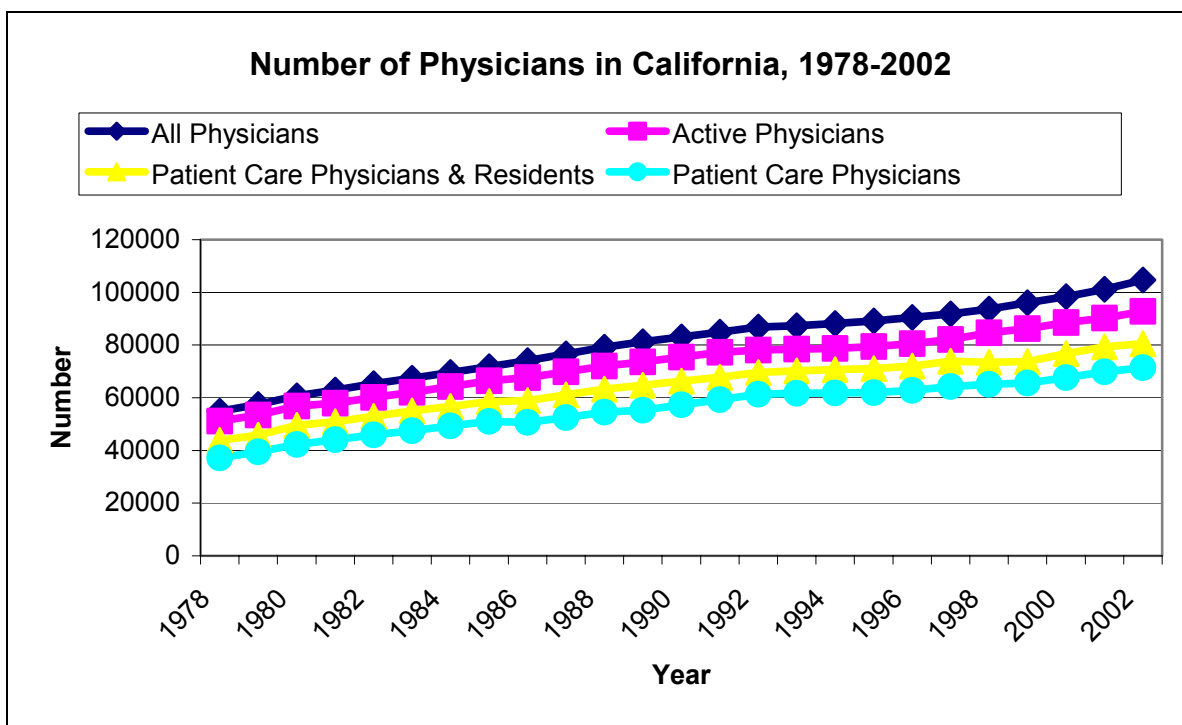
¹ These data include both federal and non-federal physicians. Federal physicians include physicians who serve in the military, as well as physicians who practice in health care facilities operated by the federal government. These facilities include hospitals and clinics operated by the Department of Veterans Affairs, The Indian Health Service, and federal prisons. Non-federal physicians encompass physicians who provide care to the general public. The vast majority of California's physicians are non-federal physicians.

2002 (see Figure 1.2). The total number of physicians in California grew by 91% during this period, rising from 55,000 physicians in 1978 to 105,000 physicians in 2002. The number of active physicians increased by 82%, and the number of patient care physicians (excluding medical residents) rose by 92% during this period. The number of medical residents rose more slowly, increasing by 38% from 6,600 medical residents in 1978 to 9,100 medical residents in 2002.

Our analyses of active physicians include all physicians who work 20 hours per week or more. The number of hours that physicians work per week varies widely with some physicians working only part-time and others working considerably more than the typical 40-hour workweek. The data are not adjusted for the number of hours worked because the AMA Masterfile does not contain information about physicians' work hours. The number of full-time equivalent (FTE) physicians in California may therefore be lower than these estimates if a significant percentage of physicians are working part-time. In addition, the AMA Masterfile is not always updated in a timely manner. The actual number of active physicians in California could be lower if the AMA Masterfile contains significant numbers of physicians who have died, retired, or relocated to other states.

However, sample data from the 2000-2001 Community Tracking Study Physician Survey (CTS-PS) allow us to test whether the physician counts in the AMA Masterfile actually represent FTE physicians. Physician counts in the AMA Masterfile would represent FTE physicians only if average annual hours worked by the physicians in the file are greater than or equal to the standard 2000-hour year (40 hours x 50 weeks). Data on estimated annual hours is available from the CTS-PS, which is a sample of data drawn mostly from the AMA Masterfile (a small percentage of physicians in the CTS-PS were drawn from the American Osteopathic Association membership file). Average annual hours worked by physicians in the CTS-PS are 2566.3 nationally and 2557.3 for California physicians (for more complete information on the CTS-PS, see Appendix 1: Data Sources). This suggests that the physician counts in the AMA Masterfile are likely to represent FTE physicians.

Figure 1.2



Source: Petris Center analysis of the AMA Masterfile.

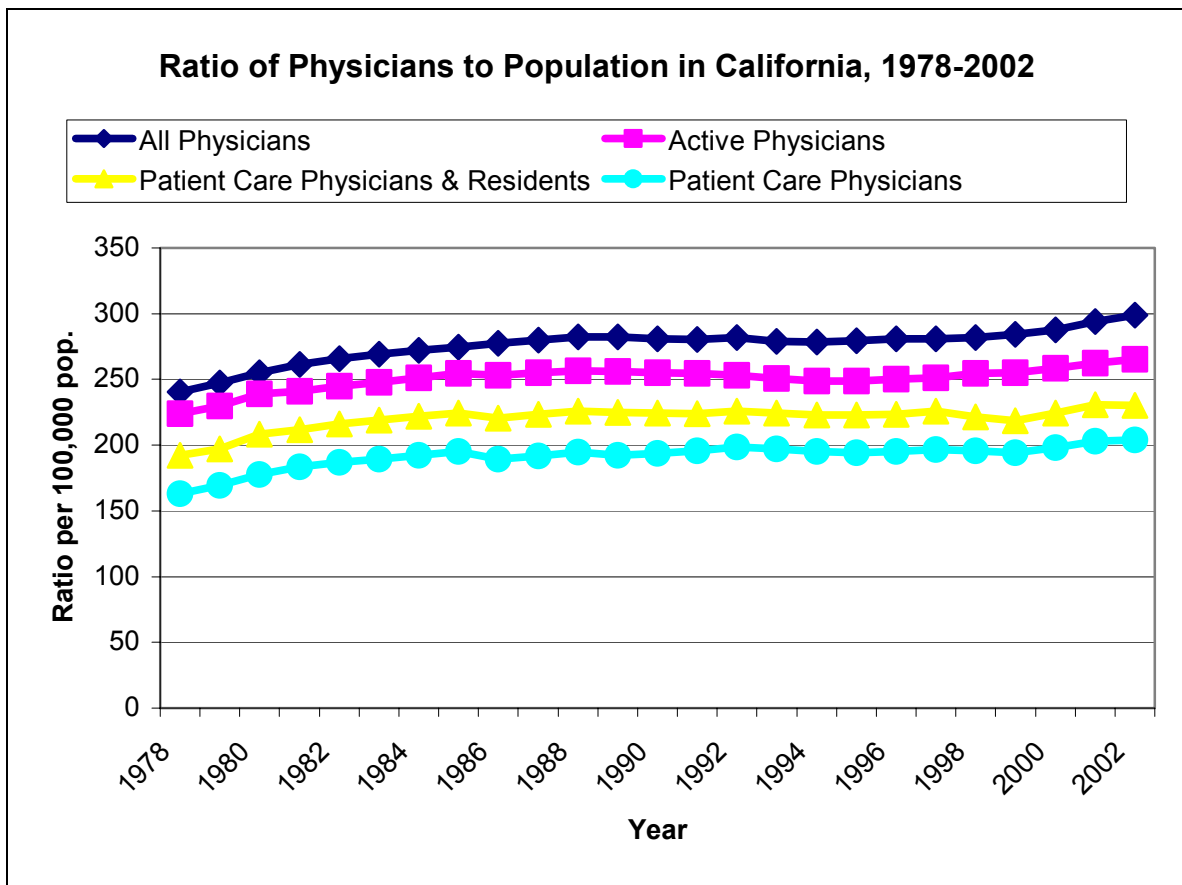
Trends in the Ratio of Physicians to Population

Trends in the number of physicians in California provide information about growth in the total supply of physicians but do not take into account factors that affect demand for physician services, such as growth in the state's population. Consideration of population trends is especially important in California because the state's population grew by 53% between 1978 and 2002 (RAND California, California Department of Finance data, <http://ca.rand.org/stats/popdemo/popdemo.html>). Physician workforce studies typically adjust for population trends by calculating ratios of physicians to population.

As Figure 1.3 indicates, much of the increase in the number of physicians in California has been absorbed by an increase in the state's population. Whereas the total number of physicians in California rose by 91% between 1978 and 2002, the ratio of physicians to population rose by only 25%, from 240 to 299 physicians per 100,000 persons. Similarly, the ratio of active physicians to population rose by only 18%, from 224 to 265 active physicians per 100,000 persons. The ratio of patient care physicians to

population rose by only 25%, from 163 to 204 physicians per 100,000 persons. These findings are consistent with previous studies (Coffman et al. 1996, Dower et al. 2001).

Figure 1.3

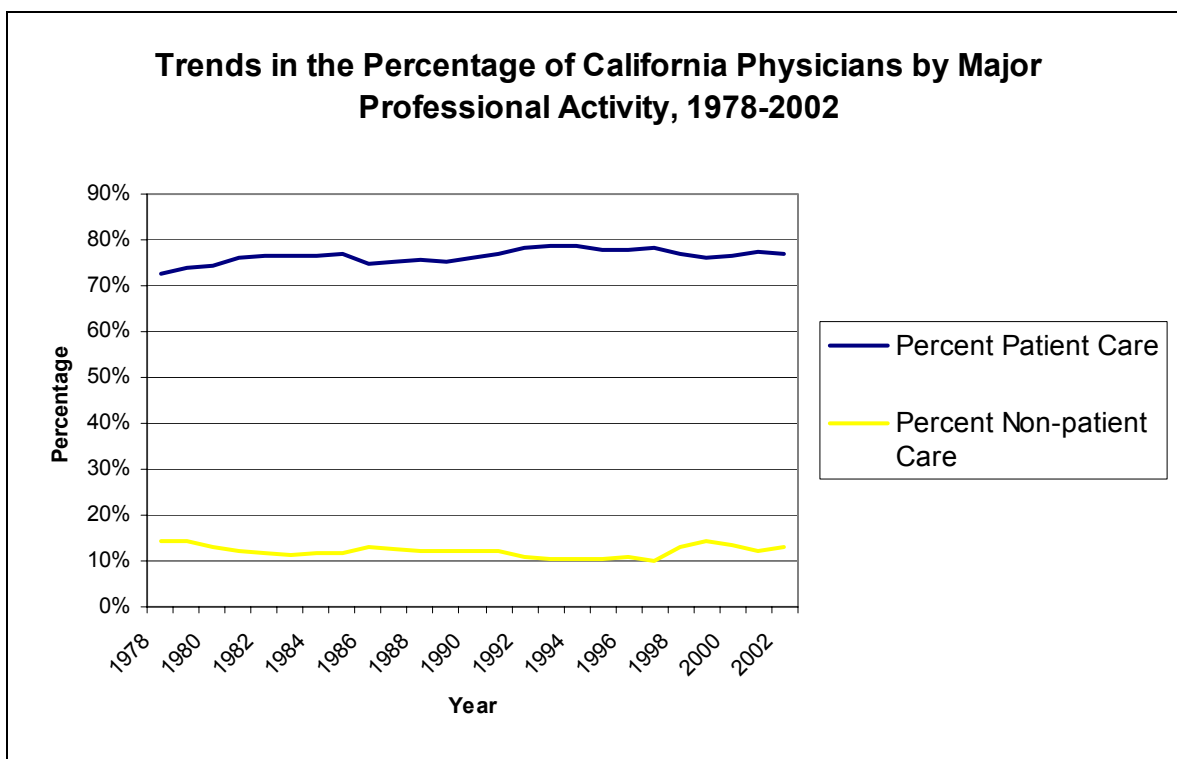


Source: Petris Center analysis of the AMA Masterfile.

Trends in Major Professional Activities

Figure 1.4 displays data on trends in the major professional activities of physicians. The percentage of active California physicians whose primary professional activity is patient care rose slightly from 73% in 1978 to 77% in 2002. The percentage of active physicians whose primary professional activity is not patient care fluctuated slightly, ranging from 10% to 14% over this period. The percentage of active physicians who are medical residents fell slightly between 1980 and 2002, from 13% to 10% of physicians. These trends indicate that the number of patient care physicians has grown more rapidly than enrollment in medical residency programs in California. As we discuss below, this disparity has occurred because California imports a large percentage of its physicians from other states and nations.

Figure 1.4

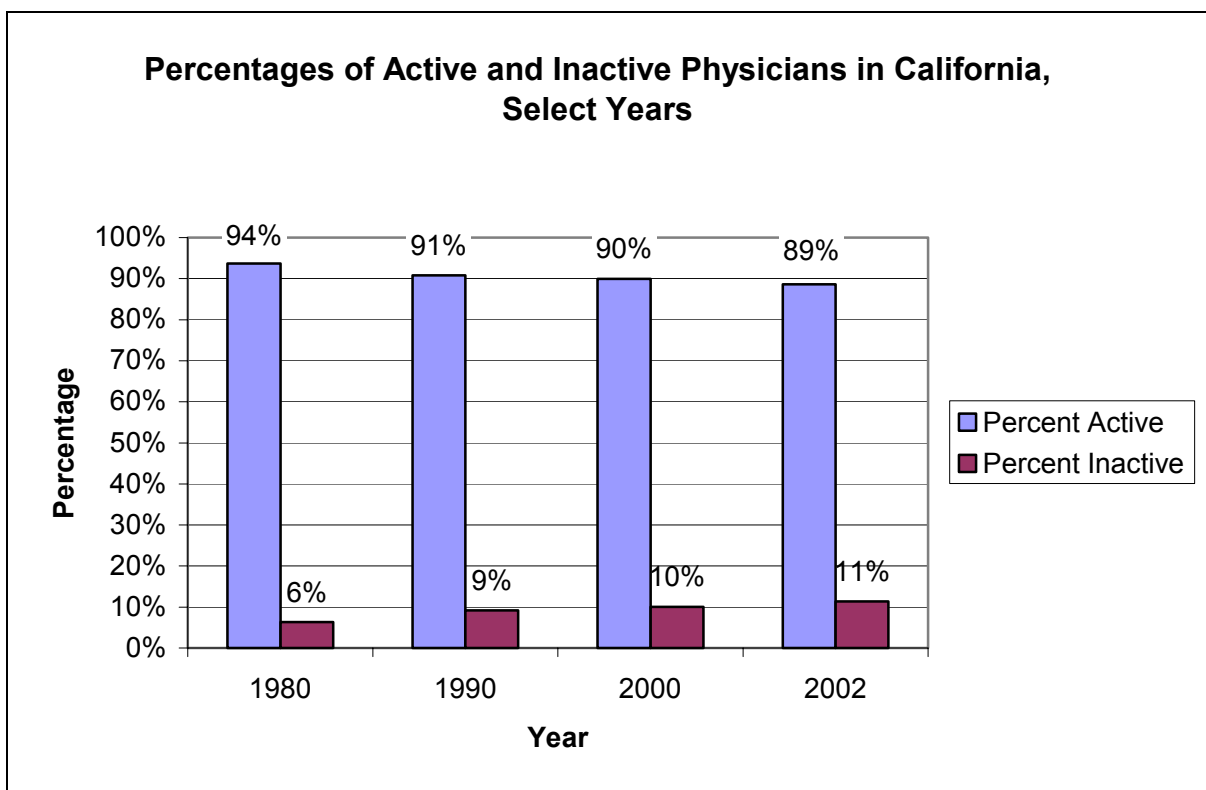


Source: Petris Center analysis of the AMA Masterfile.

Trends in Activity Rates

The proportion of California physicians in active practice decreased by five percentage points between 1980 and 2002. As Figure 1.5 indicates, in 1980 approximately 94% of California physicians were in active practice. In 2002, only 89% were in active practice. It is difficult to pinpoint the factors that have caused this decline. We speculate that the drop may reflect a reaction by California physicians to the increase in managed care in the state, an increase in the number of elderly physicians, or an increase in rates of retirement (which will be discussed later in the report). The decrease in the overall activity rate does not appear to be due to a decrease in activity rates among younger physicians. Activity rates among physicians under age 66 were stable throughout the period from 1980 to 2002.

Figure 1.5

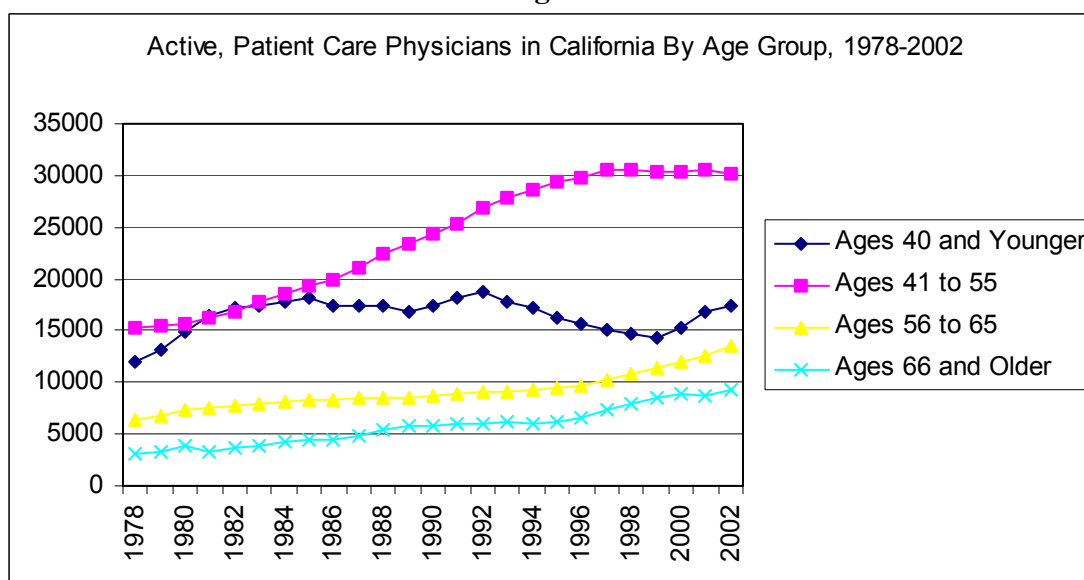


Source: Petris Center analysis of the AMA Masterfile

Trends in Age Distribution

Trends in the age distribution of California's physicians indicate that the state's physician workforce is aging. The number of active patient care physicians over age 65 more than tripled between 1978 and 2002, and the number aged 56 to 65 doubled. In contrast, the number of active patient care physicians aged 40 or younger has increased by only 45% over the same period, and has actually decreased since the early 1990s. California may not have sufficient numbers of younger physicians to offset likely retirements by older physicians and likely increases in demand due to projected population growth unless the number of young physicians in the state increases significantly.

Figure 1.6



Source: Petris Center analysis of the AMA Masterfile

Sources of California's Physicians

California imports a large number of physicians from other states and nations. The state's medical schools and residency programs have not produced sufficient numbers of physicians to meet the state's demand for medical care. According to the 2000 AMA Masterfile, only 25% of California's physicians graduated from a California medical school. Fifty percent graduated from medical schools in other states and 25% graduated from medical schools in other countries. Only 55% of California's physicians completed residency in the state (Dower et al. 2001, pg. 26). These patterns are consistent with California's population, which also has experienced high rates of immigration from other states and nations (Forte et al. 2004).

Adequacy of Physician Supply in California

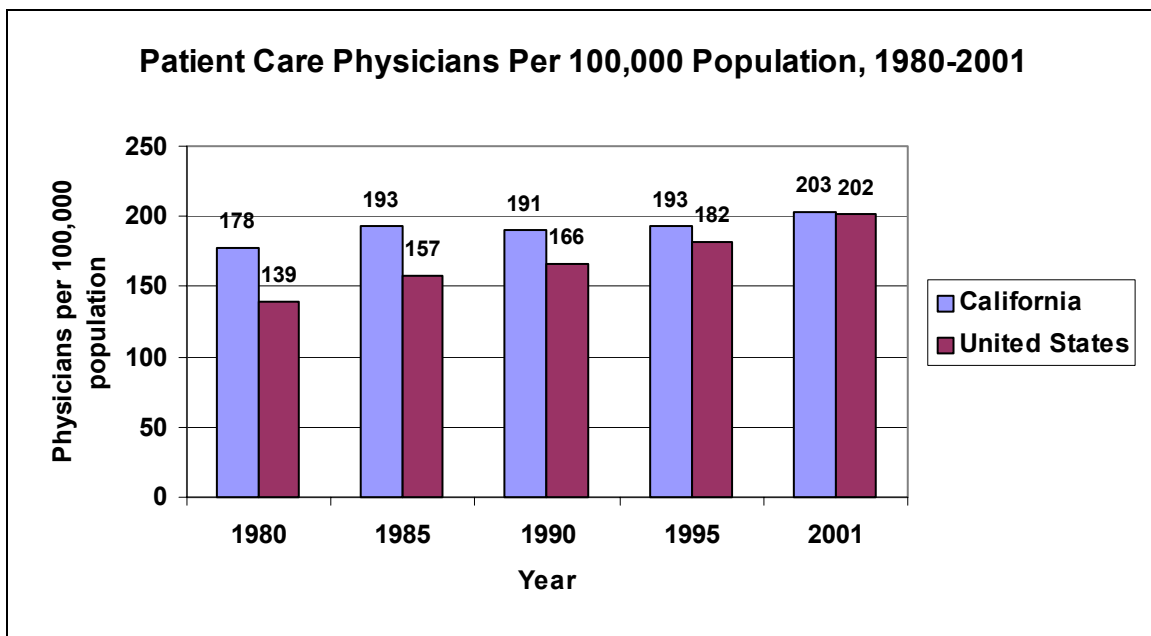
The adequacy of the supply of physicians in a state or other geographic area can be assessed in several ways. Three complementary approaches are relative benchmarking, normative benchmarking, and economic analysis of the physician labor market.²

² See Blumenthal 2004 and Forte et al. 2004, pp. 45-47, for a full discussion of major reports on the adequacy of physician supply in the United States overall.

Relative benchmarking compares the ratio of physicians to population in the geographic area of interest to the same ratios in other geographic areas. Such comparisons indicate whether and how an area's physician supply differs from other areas. In the United States, researchers often compare an area's ratio of physicians to population to the overall ratio of physicians to population in the United States.

Historically, California has had a higher ratio of patient care physicians to per 100,000 population than the U.S. overall (see Figure 1.7). However, the ratio of patient care physicians to population has grown more slowly in California than in the U.S. overall. By 2001, the ratios of patient care physicians per 100,000 population in California and in the U.S. overall had converged. California had 203 patient care physicians per 100,000 persons, while the U.S. as a whole had 202 patient care physicians per 100,000 persons. The convergence between California and other states may stem from the state's relatively high rate of population growth or from factors that may make California a less attractive place to practice than other states, such as the high cost of living and the high rate of enrollment in health maintenance organizations (HMOs).

Figure1.7



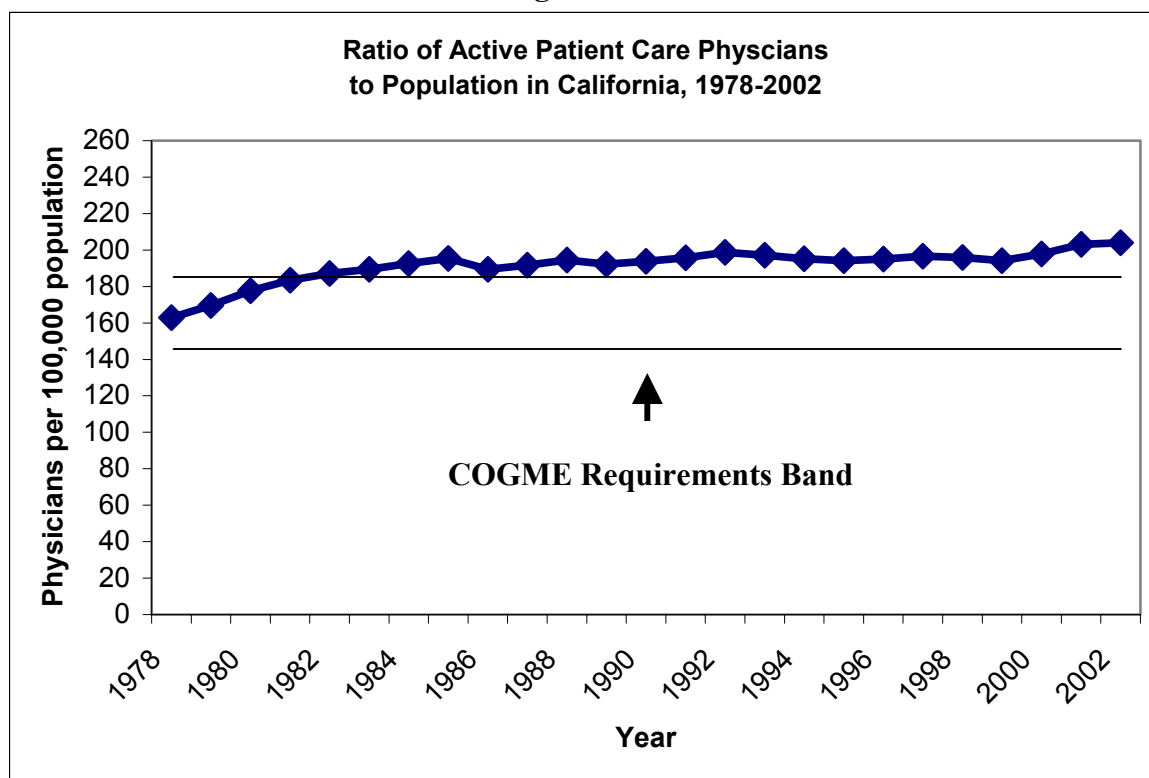
Source: Petris Center analysis of the AMA Masterfile and AMA Physician Characteristics and Distribution reports.

Another approach to assessing the adequacy of physician supply is to assess the “need” for physicians, where need is based on a normative judgment concerning the ratio of physicians to population required to meet the public’s health care needs. Such a judgment is called a “normative benchmark.” If a geographic area has a physician-to-population ratio that is less than this normative benchmark the area would be deemed to have a physician shortage.

One of the most widely cited sets of normative benchmarks are the generalist and specialist requirement bands developed by the Council on Graduate Medical Education (COGME) during the mid-1990s (COGME 1996). The requirements bands synthesize requirements for patient care physicians that were calculated using several different methods, including estimates derived from health maintenance organization (HMO) staffing patterns. COGME’s requirements band for generalists is 60 to 80 generalists per 100,000 persons and its requirements band for specialists is 85 to 105 per 100,000 persons. Combining the generalists and specialists requirements bands yields total patient care physician requirements of 145 to 185 physicians per 100,000 persons.

Figure 1.8 indicates that over the past 25 years the ratio of patient care physicians to population in California has consistently exceeded the lower bound of the COGME requirements band (145 physicians per 100,000 persons). Since 1982, the ratio of patient care physicians to population has exceeded the upper bound of the COGME requirements band (185 physicians per 100,000 persons). This suggests we currently have an ample supply of physicians in the state.

Figure 1.8



Sources: Petris Center analysis of the AMA Masterfile; COGME, *Eighth Report*, 1996.

However, the COGME requirements probably understate demand for physicians among persons with health insurance because they assume that most persons in the U.S. are enrolled in HMOs. In fact, the number of persons enrolled in HMOs fell by 6% between 2000 and 2002 (Lauer et al. 2002, pg. vii). Many consumers are enrolling in preferred provider organizations (PPOs), which do not require enrollees to obtain prior authorization for physician services and do not limit coverage to a specific network of physicians. In addition, many HMOs now offer health plans that permit enrollees to self-refer for specialty care. According to a 1998 survey, 83% of California's HMOs offer health plans that permit enrollees to obtain specialty care without prior authorization (Schauffler and Brown 1999, pg. 67). The increase in the number of persons enrolled in health plans that do not tightly manage physician services may have increased per capita demand for medical care, particularly specialty care. In addition, the COGME requirements do not account for the increase in the number of elderly Californians or changes in the prevalence and incidence of disease.

A third way to determine the adequacy of physician supply is to analyze the market for physicians. This approach assumes that the physician labor market functions like any other labor market. Labor markets are geographically based and physicians are assumed to be able to move between geographical labor markets. This approach is particularly useful because managed care has made economic signals more important in the health care marketplace.

Using this approach, we find that when patients' demand for physician services is greater than the amount of services that physicians can currently supply, health care organizations compete for the scarce services of physicians by offering them higher payments. This results in a rise in average physician income. An increase in average physician income over time within a given geographic labor market indicates that this labor market has a shortage of physicians. The increase in average physician income should induce additional physicians to enter this labor market because they can earn higher incomes there relative to those available in other labor markets.

Alternatively, when patients demand fewer physician services than the amount of services that physicians currently supply, organizations do not have to compete for physicians' services. In fact, they pay physicians less. A decline in average physician income over time indicates that there is a surplus of physicians in a given labor market. When this occurs, some physicians tend to exit that labor market because they can earn higher incomes in other labor markets.

A situation where physician incomes are neither rising nor falling is a steady state that labor economics calls equilibrium. In equilibrium neither a surplus nor a shortage of physicians exists and the number of physicians in labor market tends to remain fairly stable.

Physician labor markets work best when both insurer and consumer demand for physician services are sensitive to the price of physician services. The advent of managed care resulted in insurers becoming much more sensitive to how much they paid for physician services. In recent years, consumers have also become much more sensitive to the price of physician services, because they pay a larger percentage of the price of physician services and have more choices among service providers.

Many consumers are being required to pay for a greater portion of the health care they use (Hsu et al. 2004, Wong et al. 2001). There are a number of reasons for this. Employers are increasing employee cost sharing for health care benefits. Employee contributions to health insurance premiums rose by 50% between 2000 and 2003 (Gabel et al. 2003). Deductibles and co-payments have also increased (Draper et al. 2002, Gabel et al. 2003, Gabel et al. 2004, Trude et al. 2002).

Employers are also allowing employees greater choice of providers. Many employees have enrolled in preferred provider organization (PPO) plans under which coinsurance and co-payment rates vary depending on whether the employee obtains care from an “in-network” or “out-of-network” physician. PPOs also typically do not require enrollees to obtain referrals for specialty care. Such plan designs improve the functioning of the physician labor market because consumers enrolled in PPOs have greater discretion over the amount and types of medical services provided than those in HMOs. Enrollment in PPOs has grown dramatically since the mid-1990s, rising from 28% of employees in 1996 to 54% of employees in 2003 (Gabel et al. 2003).

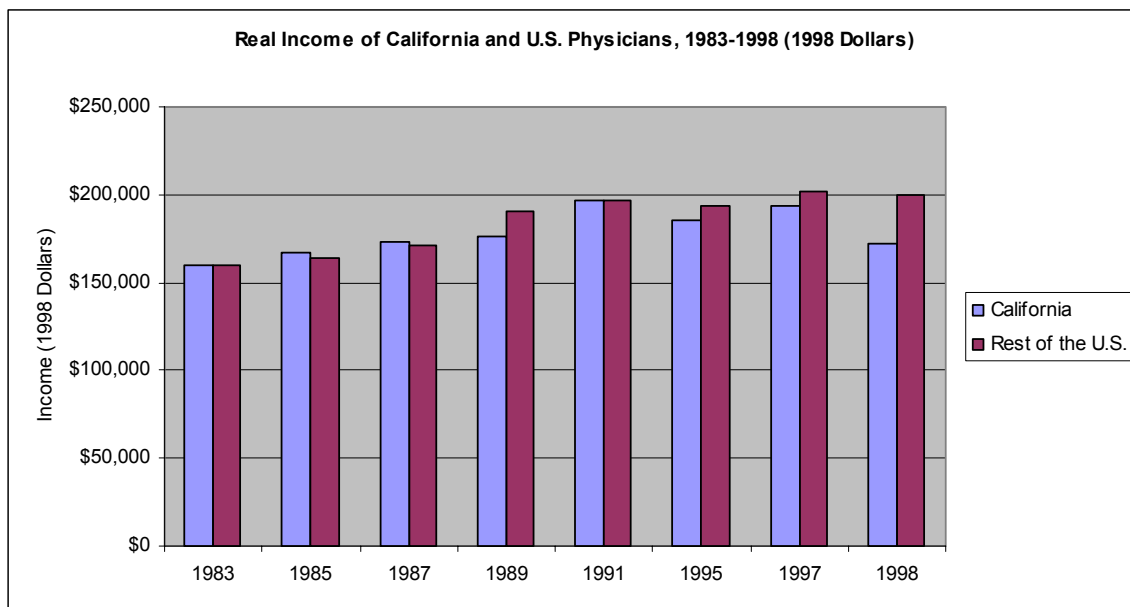
In addition, some employers have implemented “consumer-driven health care plans” that expose employees to greater financial risk for medical care. These plans may be divided into two major groups. The first group consists of plans that combine health care spending accounts with major medical policies that have high deductibles. The second group consists of “personalized” or “customized-package” plans under which employees use Internet-based tools to select from menus of health care plans and/or providers. Employers contribute a “defined contribution” (i.e., a fixed amount) and employees bear the financial risks associated with their choices (Gabel et al. 2004). Although the number of employees enrolled in consumer-driven health care plans is relatively small at present, enrollment has increased significantly over the past several years and could increase further if these plans demonstrate that they can help employers control health care costs (Gabel et al. 2004).³

³ These changes in health benefits only affect persons with employer-sponsored health insurance. Findings from the 2001 California Health Interview Survey indicate that one in five Californians was uninsured for at least part of the year in 2001 and one in ten was uninsured for over 12 months (Brown and Lavarreda 2003). As a consequence, the total amount of medical care demanded in California is probably lower than the amount of care the public needs.

Taken together, managed care, increased employee cost sharing, and increased consumer choice suggest that both insurers and consumers are more sensitive to the prices paid for physician services than in the past. As a consequence, demand for physician services is likely to change more significantly in response to changes in prices for physician services. Such changes in demand affect the average level of payments that physicians receive which, in turn, affects average physician incomes.

Figure 1.9 presents data from the AMA's Socio-economic Monitoring Survey regarding trends in physician incomes in California and the U.S. from 1983 to 1998.⁴ The average real income of California physicians increased from 1983 until it peaked in 1991. Average real physician income then declined from 1992-1998. This trend in physician income is consistent with trends in health care spending in California. The Health Services portion of California's Gross State Product decreased between 1992 and 1995 and between 1996 and 1997 (see Figure 1.10).

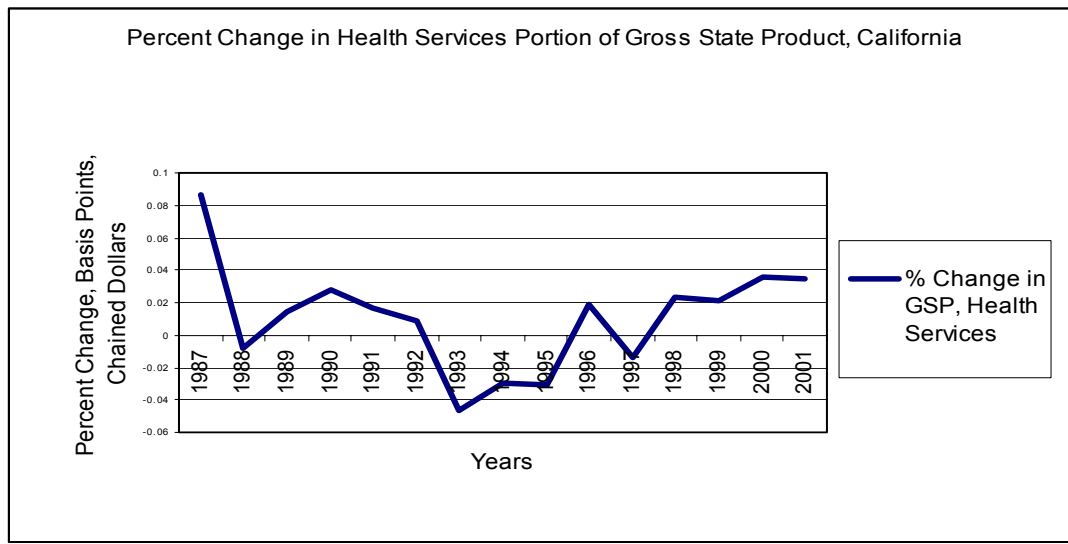
Figure 1.9



Source: Petris Center analysis of AMA Socioeconomic Monitoring Surveys, 1983-1998.

⁴ Data on physician income is not available up to the current year.

Figure 1.10



Source: Petris Center analysis of data from the Bureau of Economic Analysis.

As noted above, relative benchmarking, normative benchmarking and the economic analysis of labor markets are complementary. Each approach supplies important information to policy makers. Relative benchmarking tells us how a given area compares to other areas. This approach is important, but is insufficient by itself because it does not tell us whether any area has too many or too few physicians. This limitation can be addressed by using normative benchmarks, which can be used to tell us how many physicians are medically necessary for a given population. Relative benchmarking and normative benchmarking together tell us what the variation is across areas and whether each area has too many or too few physicians. However, neither approach can tell us whether any trends we see will continue in the same direction or reverse. This information can be obtained from economic analysis of labor markets. Economic analysis can be used to tell us whether market forces are moving the physician-to-population ratios towards the normative benchmarks or away from them and whether the variability seen in relative benchmarking is likely to become greater or to lessen.

Finally, it should be noted that there are a number of policy variables that affect physician supply that were not included in the previous analyses. Among them are the provision of educational opportunities in medicine, state licensure laws, loan repayment programs and other policies. Policymakers can use such policies to change the incentives

facing the physician labor market and thereby influence the overall number and distribution of physicians in the state.

Conclusions and Policy Recommendations

The number of physicians in California has nearly doubled over the past 25 years. Although much of this increase was matched by population growth, the ratio of physicians to population in California has grown by 25%. The ratio of physicians to population in California is similar to that of the U.S. overall, and exceeds requirements established by the Council on Graduate Medical Education.

Predicting future supply and demand for physicians is full of uncertainty. Circumstances can change so rapidly that one cannot assume that current practice patterns are a reasonable basis for predicting physician supply 10 to 20 years from now. Much will depend on the strategies that organizations providing health care services pursue and the pace of medical advances.

Our findings suggest that California has an adequate number of physicians. However, California policymakers should closely monitor trends in the supply of, and demand for, medical care. In particular, policymakers should examine trends in the age distribution and retirement rates of physicians. Thirteen percent of California's active patient care physicians are older than age 65 and 19 are between 56 and 65 years of age. Twenty-one percent of California's physicians are over age 65 and 18% are 56 to 65 years old. Some of these physicians have already retired and many more are likely to retire over the next 10 years. To replace these physicians, California will need to reverse the decrease in the number of physicians under age 40 that has occurred over the past decade.⁵

Timely and accurate information can help California policymakers develop appropriate physician workforce policies. As we will see in the following chapters, this information should encompass not only data on the number and ratio of physicians to population, but also data on physicians' specialty mix, geographic distribution, and

⁵ Some experts caution against making predictions about the adequacy of physician supply in the future without developing formal models for forecasting physician supply. These cautions are well advised. Formal forecasting models make assumptions about future supply and demand for physicians explicit and allow for assessment of the multiple scenarios. Recent forecasts of physician supply and demand in California from 2000 to 2015 range from a surplus of 8% to a shortage of 28% (Forte et al. 2004).

race/ethnicity. An important first step in this data collection process is the Medical Board of California's survey of all physicians in the state. The survey, first administered in April 2003, was designed to gain a better understanding of the physician workforce in the state and to provide policymakers with timely information. However, state budget cuts are jeopardizing the Medical Board's ability to collect and analyze survey data. Policymakers should ensure that the Medical Board receives sufficient resources to complete the survey.

Policymakers also need to analyze factors that may increase future demand for physicians such as trends in population growth and trends in the burden of disease. According to estimates from the California Department of Finance, California's population is expected to grow by 19% between 2004 and 2020 (<http://ca.rand.org/stats/popdemo/popdemo.html>). In addition, the number of Californians with chronic illness will rise as the number of elderly Californians increases. Over the next decade, the number of Californians over age 65 is projected to increase more rapidly than the number of children and non-elderly adults. Older adults are much more likely to report poor health than younger persons (Forte et al. 2004). Trends in health behaviors, such as diet and exercise, and environmental factors, such as air quality, may also affect demand for medical care.

On the other hand, innovations in the delivery of medical care may decrease demand for physicians relative to current practice patterns. Advances in information technology may reduce the number of face-to-face visits with physicians. The use of group visits may increase the number of patients a physician can treat. In addition, health care organizations may continue to increase utilization of nurse practitioners, physician assistants, and other non-physician clinicians. Furthermore, the number of Californians seeking care from alternative or complementary providers as a substitute for, or supplement to, traditional medical care may increase.

If California experiences a shortage of physicians in the future, California policymakers can choose from several types of policies. One set of policy options would focus on increasing the number of physicians practicing in California. Examples of this approach include expansion of California's medical schools and residency programs or the creation of financial incentives to encourage physicians from other states to relocate

to California. Historically, California has imported large numbers of physicians from other states and nations. Training more physicians in state would reduce California's dependence on other states and nations for physicians.⁶

However, policymakers need to keep in mind that the high cost of living in California may limit the effects of expansion of medical education and other supply side policies. The 10 largest metropolitan areas in California have a higher cost of living than the U.S. median for metropolitan areas (ACCRA 2003). The New York metropolitan area is the only area of the U.S. in which the cost of living is as high as in the San Francisco Bay Area. Boston, Chicago, Honolulu, New York and Washington, D.C. are the only metropolitan areas in which the cost of living is equal to or greater than the Los Angeles and San Diego areas. Expansion of medical education will not necessarily increase physician supply in California if many physicians decide to pursue career opportunities in other states following graduation.

A second set of policy options involves revamping the manner in which medical care is delivered. Current practice patterns rely heavily on individual physicians to deliver services through face-to-face encounters with individual patients. Increased investment in telemedicine and other types of information technology may reduce demand for face-to-face visits and provide information about patients' conditions and treatment options that may enable physicians to treat more efficiently. Policymakers could also increase investment in the training of non-physician clinicians, such as nurse practitioners and physician assistants, who can provide many of the same services as physicians.

This chapter has provided an overview of trends in the overall supply of physicians in California. While this information is very important, policymakers need further detail to make sound decisions. Subsequent chapters will examine trends in specialty distribution, geographic distribution, and the race/ethnicity of California's physicians, as well as trends in the numbers of nurse practitioners and physician assistants.

⁶ The number of medical students in California has increased over the past decade due to the opening of the Touro College of Osteopathic Medicine in Vallejo.

CHAPTER 2: DOES CALIFORNIA HAVE A SHORTAGE OF SPECIALISTS?

A thorough assessment of California's physician workforce must go beyond a broad overview of trends in the number of physicians and the ratio of physicians to population. Policymakers also need information about trends in major physician specialties, because many Californians have chronic diseases or conditions that require specialized care. In addition, some medical groups, hospitals, and health plans in California are having difficulty recruiting specialist physicians (California Medical Association 2001, California Senate Office of Research 2003, Mittler and Gold 2003). These reports differ sharply from assessments made during the 1990s. At that time, experts believed that California faced a shortage of generalist physicians and a surplus of specialist physicians (Grumbach et al. 1998). In this chapter, we assess the adequacy of physician supply in major specialties by first examining trends in physician-to-population ratios. We then examine these trends more closely using relative and normative benchmarks. Finally, we examine the economics of the physician labor market.

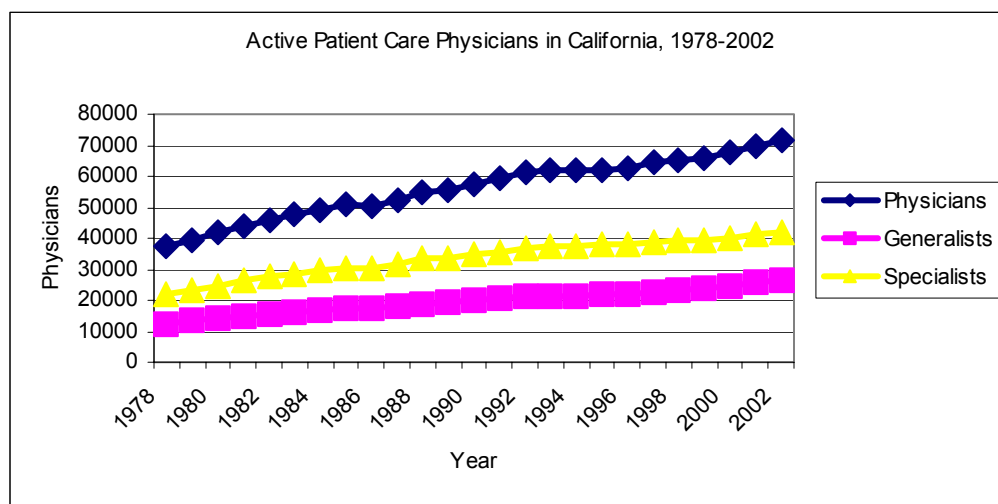
Trends in the Supply of Generalist and Specialist Physicians

Physicians are often categorized into two large groups: generalists and specialists. Generalists provide primary care and preventive services to persons with a wide variety of diseases and conditions. Specialists treat persons with specific types of diseases or conditions (e.g., cardiovascular disease), or furnish specific services (e.g., anesthesia). Consistent with many prior studies of the physician workforce, we define generalists as encompassing physicians in the specialties of family practice, general internal medicine, general pediatrics, and general practice. We focus on physicians whose major professional activity is patient care because these physicians are most likely to be affected by changes in health care markets.

The numbers of both generalists and specialists in California whose major professional activity is patient care doubled between 1978 and 2002. As Figure 2.1 illustrates, the number of generalists in California rose from approximately 13,000 to 27,000 during this period. Similarly, the number of specialists rose from 22,000 to 42,000. During the mid-1990s, the number of patient care generalists grew more rapidly than the number of patient care specialists. This trend probably reflects changes in

demand for physicians that resulted from a dramatic increase in HMO enrollment during this time period. HMO enrollment in the United States increased by 100% between 1993 and 1998 (Lauer et al. 2002, pg. vii). Many HMOs attempted to control costs by tightly managing the utilization of specialists through utilization review, referral and prior authorization requirements, and other techniques. These practices reduced demand for many types of specialty care and may have led to a reduction in the rate of growth in career opportunities in many specialties.

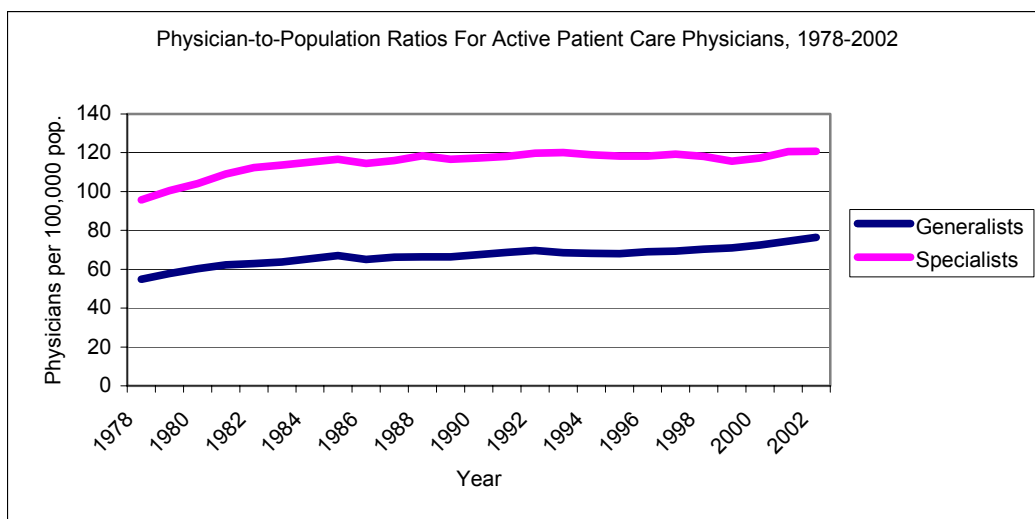
Figure 2.1



Source: Petris Center analysis of AMA Masterfile.

The ratios of patient care generalists and specialists to population have grown more slowly than the actual numbers of patient care generalists and specialists, because much of the increase in generalists and specialists in California has been absorbed by population growth. As Figure 2.2 indicates, the ratio of patient care generalists per 100,000 persons rose by 40% between 1978 and 2002, from 55 per 100,000 persons in 1978 to 77 per 100,000 persons in 2002. The ratio of patient care specialists per 100,000 population rose by 26%, from 96 per 100,000 persons in 1978 to 121 per 100,000 persons in 2002. Consistent with previous findings (Dower et al. 2001), we find that in recent years the ratio of specialists to population has grown more slowly than the ratio of generalists to population.

Figure 2.2

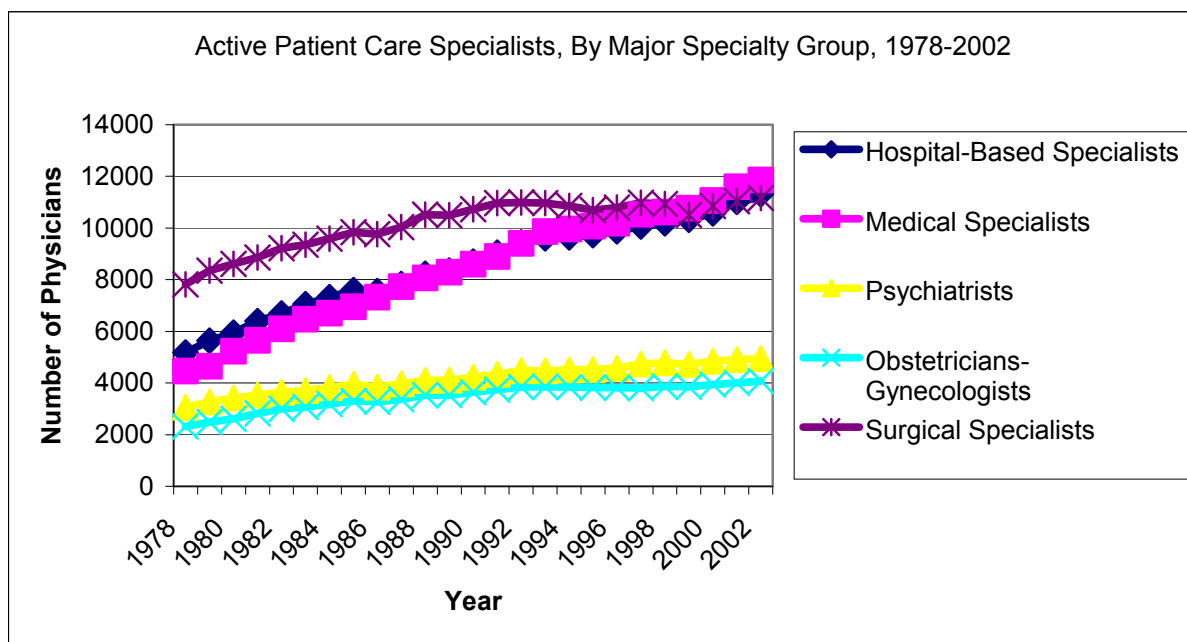


Source: Petris Center analysis of AMA Masterfile.

Trends in the Supply of Major Specialty Groups

Trends in the total number of patient care specialists provide only limited insights into the adequacy of the supply of specialists, because the types of medical services provided by specialists and the needs of their patients vary widely. To address this limitation, we divide patient care specialists into five major groups based on the types of services they provide and the diseases and conditions they treat: hospital-based specialists, medical specialists, obstetrician/gynecologists, psychiatrists, and surgical specialists (including general surgeons). As Figure 2.3 illustrates, between 1978 and 2002 the number of patient care physicians in California increased for all five major specialty groups. The numbers of medical specialists, hospital-based specialists, psychiatrists, and obstetrician/gynecologists increased steadily throughout this time period. In contrast, the number of surgical specialists has leveled off since the early 1990s.

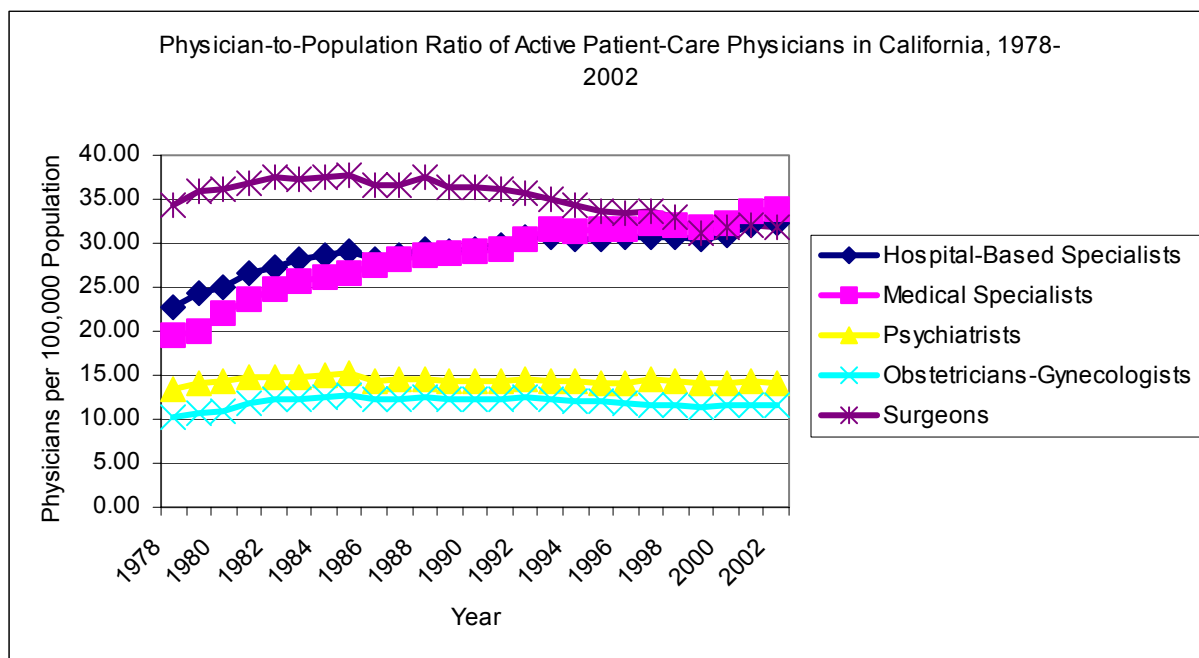
Figure 2.3



Source: Petris Center analysis of AMA Masterfile

The wide variation in rates of growth across the five major specialty groups has caused trends in ratios of patient care physicians to population to differ widely across the five groups of specialists. As Figure 2.4 illustrates, ratios of hospital-based specialists and medical specialists to population have risen dramatically since the late 1970s, because the numbers of hospital-based and medical specialists in California have grown more rapidly than the state's population. In contrast, the number of surgical specialists has grown more slowly than the population. As a consequence, the ratio of surgical specialists to population has decreased by 15% since the late 1980s.

Figure 2.4



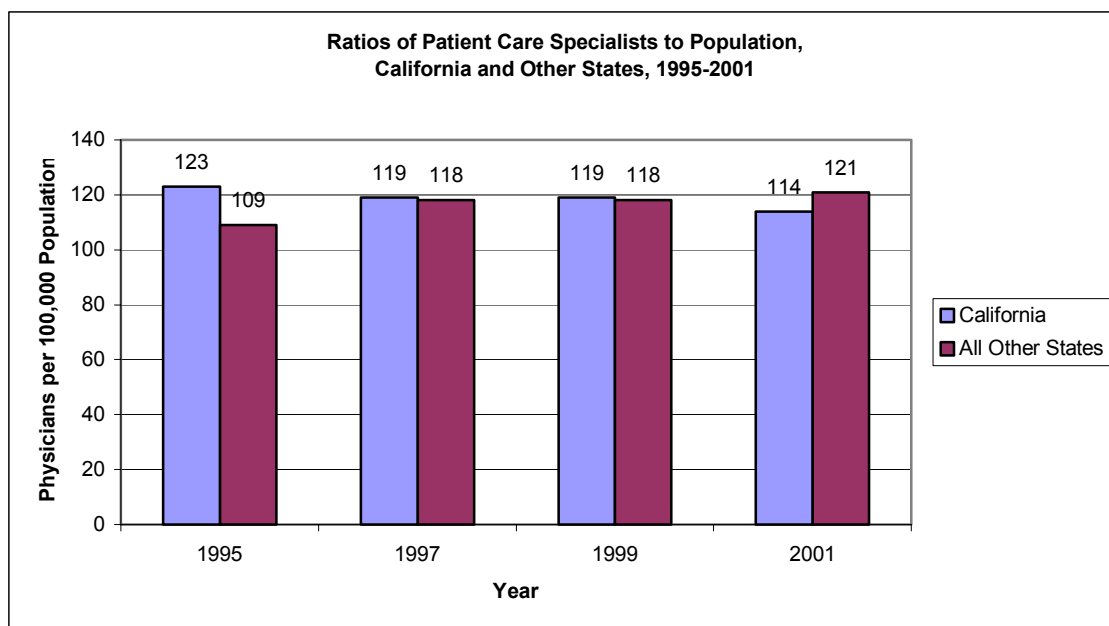
Source: Petris Center analysis of AMA Masterfile.

Adequacy of Supplies of Generalists and Specialists

As discussed in Chapter 1, analysts use three primary methods for assessing the adequacy of physician supply in a geographic area: relative benchmarking, normative benchmarking, and economic analysis of the labor market. Relative benchmarks indicate whether the supply of physicians in the geographic area of interest differs from that of other geographic areas. Normative benchmarks provide uniform standards by which the adequacy of physician supply in a geographic area can be assessed. Economic analysis of the labor market examines trends in physician income to assess the signals physicians are receiving regarding the demand for their services.

Looking at relative benchmarks we see that, historically, California's ratio of specialists to population has been higher than the average in the rest of the United States. However, as Figure 2.5 indicates, the ratio of specialists to population in California has not kept pace with the ratio of specialists to population in the rest of the country in more recent years. In 2001, California had 114 non-federal patient care specialists per 100,000 persons whereas the other states had 121 patient care specialists per 100,000 persons.

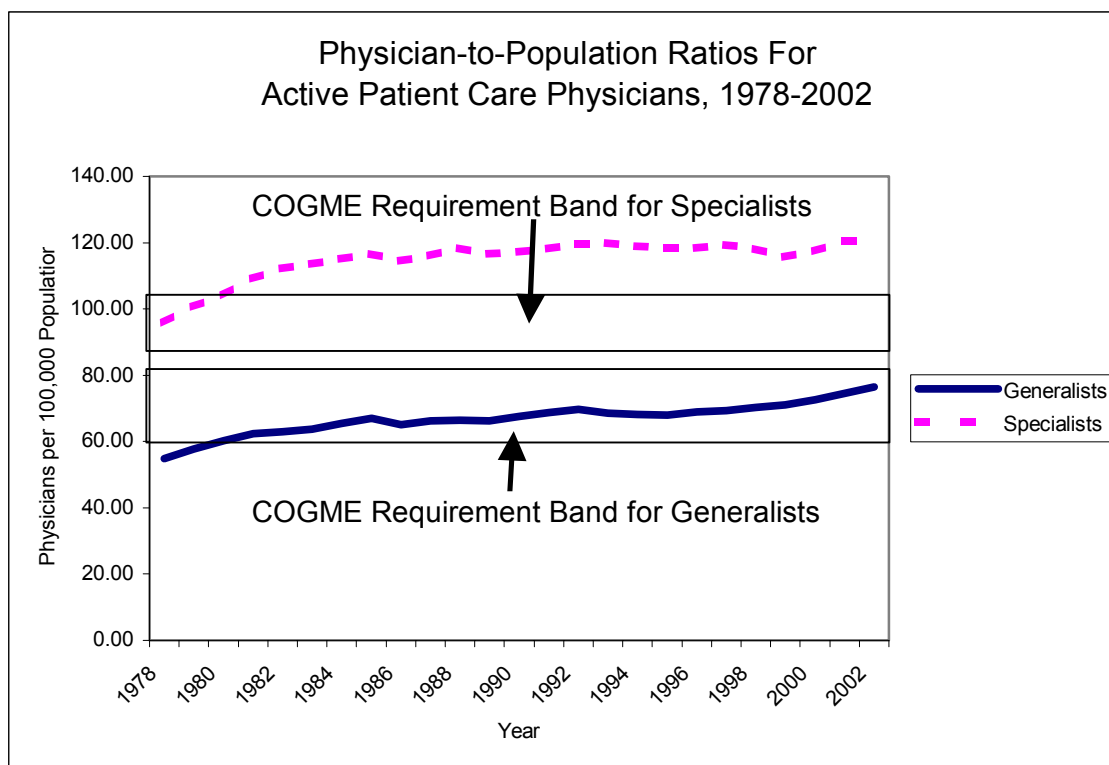
Figure 2.5



Source: Petris Center analysis of AMA Physician Characteristics and Distribution reports for select years. Note: Data for California differ from those displayed in Figure 2.2 because data were obtained from different sources. The data shown in Figure 2.2 are from the raw AMA Masterfile. The data in Figure 2.5 are from the AMA's Physician Characteristics and Distribution reports.

Turning to normative benchmarks, we note that COGME's requirements band for generalists is 60 to 80 generalists per 100,000 persons and its requirements band for specialists is 85 to 105 specialists per 100,000 persons. As Figure 2.6 indicates, since 1980, the ratio of patient care generalists to population in California has fallen within the COGME requirements band. Over the same period, the ratio of patient care specialists to population has exceeded the COGME requirements band. Thus, California's overall supply of specialists appears more than adequate relative to the COMGE benchmarks. However, as we discussed in Chapter 1, the COGME requirements bands may underestimate demand for medical care. (See Chapter 1, p. 14 for further information about the COGME requirements bands.)

Figure 2.6



Sources: Petris Center analysis of AMA Masterfile; COGME, *Eighth Report*, 1996.

Finally, economic analysis of the physician labor market suggests that supplies of both generalists and specialists in California may be moving away from the COGME requirement bands. Table 2.1 shows average real physician income for both the U.S. and California for the latest years available: 1995-1999. The categories of physicians are somewhat different from those used in the rest of this chapter because the data were obtained from the Community Tracking Study.⁷

⁷ Income data were obtained from the Community Tracking Study Physician Survey because the AMA Masterfile does not contain income data and the California subsample for the AMA Socioeconomic Monitoring Survey is too small to obtain reliable estimates for specialties. See Appendix A for an explanation of the sampling procedures for the Community Tracking Study Physician Survey.

Table 2.1
California and U.S. Physician Incomes, 1995-1999

California								
	All Physicians	Internal Medicine	Family Practice	Pediatrics	Medical Specialties	Surgical Specialties	Psychiatry	Obstetrics/ Gynecology
1995	174,999	150,508	141,505	140,847	191,102	225,964	119,256	207,232
1999	168,711	142,475	129,259	125,313	193,284	234,410	124,658	165,255
Change	-3.59%	-5.34%	-8.65%	-11.03%	1.14%	3.74%	4.53%	-20.26%

United States								
	All Physicians	Internal Medicine	Family Practice	Pediatrics	Medical Specialties	Surgical Specialties	Psychiatry	Obstetrics/ Gynecology
1995	187,208	150,475	144,805	137,569	199,356	250,378	143,509	222,235
1999	176,185	139,856	132,209	129,651	193,789	239,877	137,718	202,084
Change	-5.89%	-7.06%	-8.70%	-5.76%	-2.79%	-4.19%	-4.03%	-9.07%

Source: Petris Center Analysis of data from the Community Tracking Study Physician Surveys, 1996-97, 1998-99, 2000-01: Appendix 3 of Brown et al, (2003).

Nationally, average real physician incomes decreased in all major specialties from 1995 to 1999. The largest declines in income were in family practice and obstetrics/gynecology. In California, trends in the average real incomes of generalist physicians were similar to those at the national level. In contrast, trends in the income of California's specialists differed sharply from national trends. Incomes of surgical specialists, medical specialists, and psychiatrists rose between 1995 and 1999.

While the current situation in 2004 may be somewhat different from the situation in 1999, these findings suggest that, as of 1999, California had a surplus of generalists and shortages of some types of specialists. The decrease in the incomes of generalists suggests that health plans had access to abundant numbers of these physicians and sought to control costs by paying them less. The increased incomes of surgical specialists, medical specialists, and psychiatrists suggest that health plans had to increase payments to obtain sufficient numbers of these specialists. These patterns may reflect an increase in the demand for these specialties while supply has decreased.

Looking at the supply side of the labor market we note two items that suggest that the supply of specialists has contracted. The first is the reduction in the physician-to-population ratio for surgical specialists noted above. The second is that residency program enrollment has decreased in many specialties. Reductions in residency enrollment reduce the number of graduates, which increases competition among health

care organizations interested in recruiting new graduates. Total enrollment in general surgery residency programs in the United States decreased by 10% between 1993 and 2002, from 8,243 residents to 7,412 residents (JAMA 1993 – JAMA 2002). Total U.S. enrollments in residency programs in neurological surgery, obstetrics-gynecology, ophthalmology, otolaryngology, and urology have also decreased since the mid-1990s. Enrollment also fell in residency programs in some hospital-based and medical specialties. The most dramatic reduction in enrollment occurred in anesthesiology, in which total enrollment in the U.S. fell from 5,696 residents in 1993 to a low of 3,603 in 1998. Although total enrollment in anesthesiology residency programs has rebounded somewhat, rising to 4,578 in 2002, the specialty experienced a net decrease in enrollment of 20%. Other specialties experiencing large reductions in enrollment include cardiovascular disease (18%), neurology (16%), pathology (18%), and psychiatry (13%).

On the demand side, there are at least three reasons to suggest that the demand for the services of specialist physicians has been rising. First, growth in the number of elderly Californians has led to an increase in the percentage of the population with multiple chronic conditions that require specialty care. Second, advances in clinical research and biomedical technology, such as the Human Genome Project, are improving our understanding of disease and are generating new diagnostic tests, pharmaceuticals, and surgical procedures that have also increased demand for specialty care.

Third, consumers have greater discretion in obtaining specialty care. As discussed in Chapter 1, the number of consumers enrolled in health plans that tightly manage utilization of specialists has decreased in recent years. Most HMOs in California now offer health plans that permit enrollees to self-refer for specialty care (Schauffler and Brown 1999). In addition, many Californians have enrolled in preferred provider organizations (PPOs), which typically do not require enrollees to obtain authorization before visiting specialists. Although precise estimates of the effects are not available, it is likely that these three factors may have increased demand for specialty care beyond the level supplied by California's specialists.

Combining our analysis of the relative and normative benchmarks with the economic analysis we find that the market appears to be moving the state's overall specialist physician-to-population ratio above the upper limit of the COGME requirement

band for medical specialists, surgical specialists, and psychiatrists. This suggests that the market values specialist physicians above the level of need implied by COGME. The market also appears to be moving the ratio of generalists-to-population downward, which indicates that the market may not value generalists as highly as one might infer from the COGME requirements.⁸

Conclusions and Policy Recommendations

Trends in the numbers of physicians and ratios of physicians to population in California vary across specialties. The statewide ratio of generalist physicians to population increased during the 1990s and appears adequate to meet the states' overall needs.⁹ Statewide trends differ among major specialty groups. Ratios of hospital-based and medical specialists to population have increased dramatically. Ratios of obstetrician/gynecologists and psychiatrists have remained stable. Surgical specialists are the only major specialty group for which the ratio of physicians to population has decreased.

There is evidence that incomes may be declining for generalist physicians and rising for some specialist physicians, which may indicate a mild surplus of generalist physicians and a shortage of some specialist physicians. Large decreases in the numbers of medical residents trained in certain specialties may have increased competition for new residency graduates in these specialties. In addition, the increase in the number of elderly Californians, advances in bio-medical technology, and reductions in enrollment in health plans that tightly control access to specialists have probably increased demand for specialty care in California.¹⁰

However, policymakers should be wary of implementing policies to increase physician supply in specialties that appear to have shortages. The supply of specialty physicians is already above the COGME requirement band for specialists. In addition, the technology and delivery systems of specialty care are changing and may alter the

⁸ Our analysis of the physician labor market was conducted at the statewide level. Income trends may vary across local labor markets in California.

⁹ However, as we will discuss in Chapter 3, some areas of California have shortages of generalist and/or specialist physicians.

¹⁰ As discussed in Chapter 1, note 5, making predictions about the adequacy of future physician supply is problematic.

future demand for various types of specialty care. For example, medication has replaced surgery as the standard therapy for some diseases and conditions. Innovations in interventional cardiology and interventional radiology may be increasing demand for cardiologists and radiologists relative to surgeons. In addition, many specialists may make more extensive use of physician assistants and nurse practitioners to conduct patient histories, educate patients about procedures, assist in the operating room, and provide follow-up visits.

California policymakers would benefit from more timely and accurate information about the supply of and demand for physician services in California. Improved information about trends in physician incomes by major specialty would be especially useful because change in income is a good indicator of changes in demand for physicians. More systematic data on recruitment difficulties would also be helpful. The California Medical Board's survey of all licensed physicians is an important step in the right direction. However, budget cuts are hindering the Medical Board's ability to complete the survey. Policymakers should ensure that the Medical Board has sufficient resources to administer the survey on a regular basis and disseminate its findings.

This chapter has provided an overview of statewide trends in the specialty distribution of physicians, without addressing whether supplies of generalist and specialist physicians are equally distributed across the state. Even though overall supplies of generalists and specialists appear adequate, some areas of the state may have shortages. The geographic distribution of physicians is discussed in the next chapter.

CHAPTER 3: ARE CALIFORNIA'S PHYSICIANS WHERE WE NEED THEM?

Statewide trends in physician supply provide only a broad overview of access to physician services in California. To make sound decisions, policymakers also need information about the geographic distribution of the state's physicians. This chapter discusses trends in the geographic distribution of California's physicians and examines factors associated with geographic variations in physician supply. Ratios of patient care physicians to population are compared in counties that differ with respect to selected health care market, socio-economic, and demographic characteristics. We also examine whether some counties have persistent shortages or surpluses of physicians. As in Chapter 2, we will present data on patient care physicians, because changes in health care markets have greater effects on patient care physicians than on physicians whose primary activity is not patient care. Patient care physicians also have the most direct impact on the health and well-being of Californians.

This chapter focuses on trends in physician supply in California at the county level. We examine physician supply at the county level because studies of the physician workforce often use these geographic units to assess the distribution of physicians. However, counties are not the ideal units for analyzing physician distribution because the boundaries of markets for physician services may not be contiguous with county boundaries. Markets for generalist physicians may be smaller than counties because many of California's counties cover such large geographic areas that people may be unwilling or unable to travel from one part of the county to another to obtain routine care. Conversely, markets for specialist services may be larger than counties. Some counties have such small populations that they cannot support specialists, particularly those who treat a narrow range of diseases and conditions. In addition, persons may be willing to travel longer distances to obtain specialty care for severe or chronic illnesses.

Counties with High and Low Supplies of Patient Care Physicians

California has experienced many demographic changes over the past 25 years. One of the most important developments has been the rapid growth of population in counties on the fringes of the Los Angeles and San Francisco Bay areas, in the Central

Valley, and in the Sierra foothills. The Central Valley has experienced the highest rates of population growth with most counties in the region now classified as metropolitan areas. Counties on the fringes of the San Francisco Bay Area that were once predominantly agricultural, such as San Benito and Sonoma, now function primarily as outer-ring suburbs. Many retirees have migrated from northern California's metropolitan areas to the Sierra foothills to enjoy the scenery and lower cost of living. One might expect physicians to be attracted to these areas because population growth increases demand for medical care.

Figures 3.1-3.3 show how California's counties compare with respect to physician-to-population ratios. The maps examine physician-to-population ratios for all active, patient care physicians in California, as well as active, patient care generalist and specialist physicians. The maps indicate that there is significant variation in the number of physicians per 100,000 population from county to county. For example, counties in the Bay Area have much higher physician-to-population ratios than counties in the Central Valley and rural northern California.

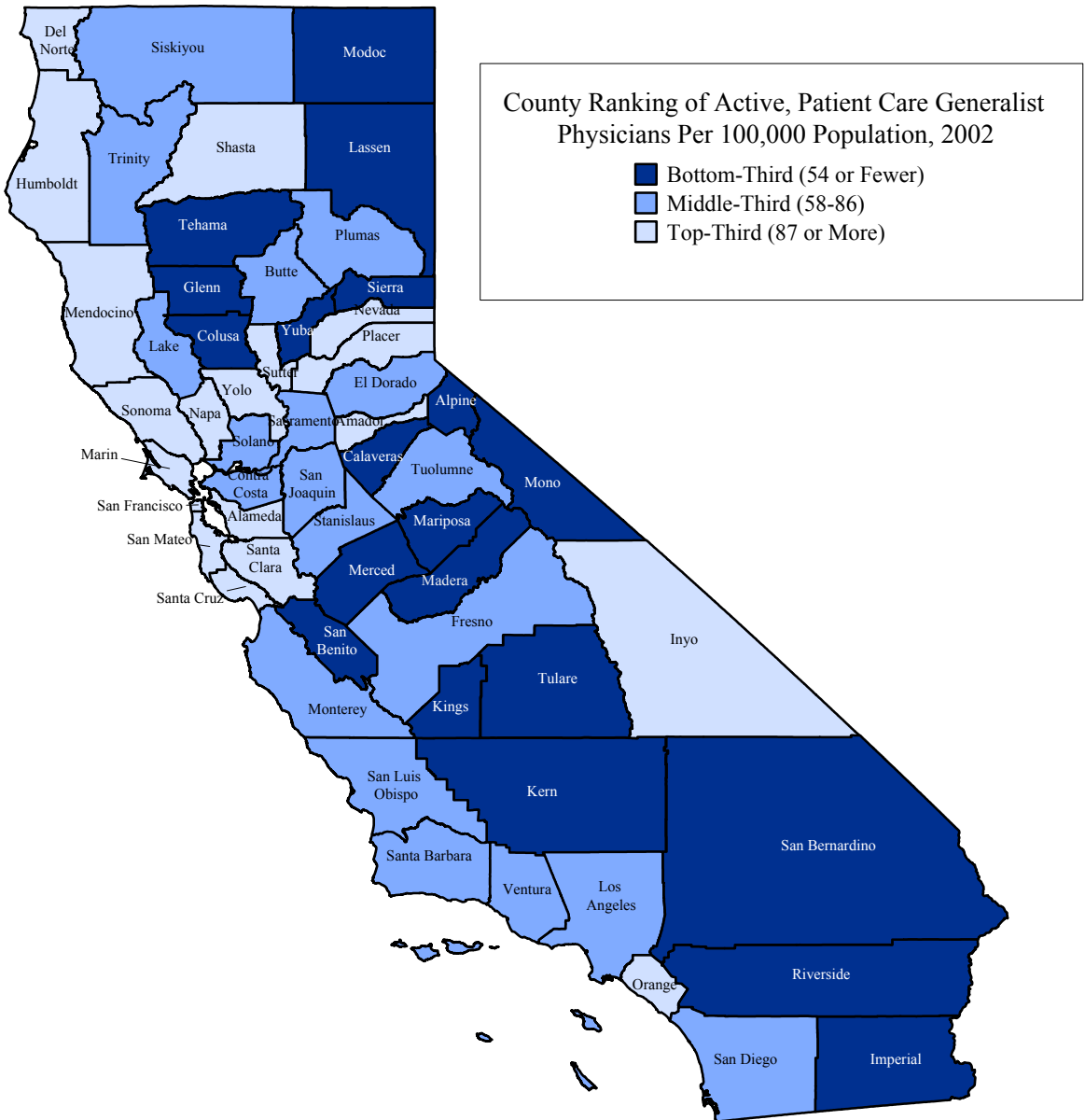
An examination of ratios of patient care physicians to population suggests that the geographic distribution of California's physicians has not changed significantly since the late 1970s. Tables 3.1 and 3.2 display California counties with the ten highest and the ten lowest ratios of patient care physicians to population, respectively, among California's 58 counties for select years between 1978 and 2002. (Data on physician-to-population ratios in all counties can be found in Appendix B.) Throughout the past 25 years, affluent, metropolitan counties in the San Francisco Bay Area and in Southern California have consistently had the highest ratios of physicians to population, while poor, rural areas of northern California, the Central Valley, and the Imperial Valley have repeatedly had the lowest ratios.

Is There a Doctor in the House?



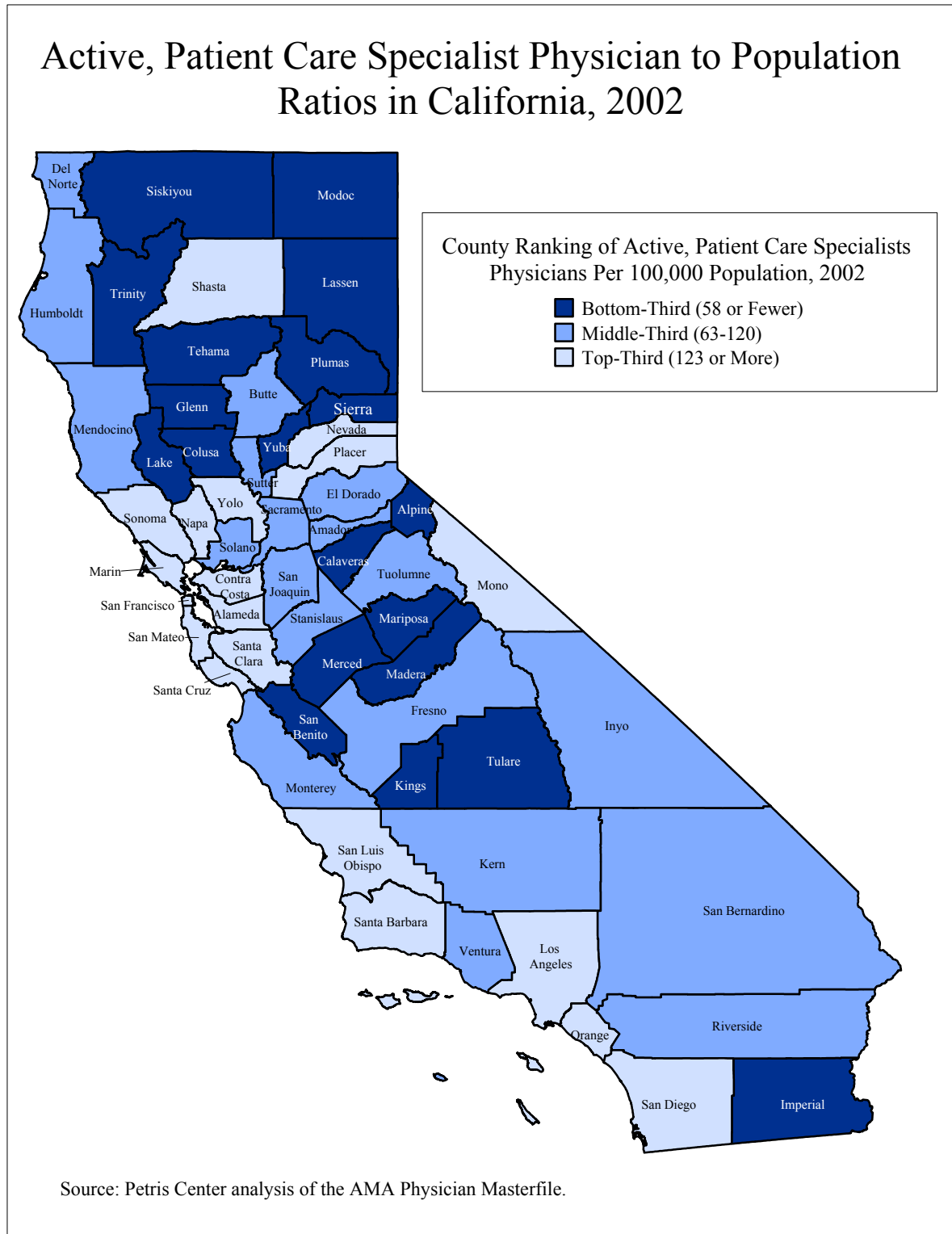
Figure 3.2

Active, Patient Care Generalist Physician to Population Ratios in California, 2002



Source: Petris Center analysis of the AMA Physician Masterfile.

Figure 3.3



Five of the counties that were in the Top 10 in 2002 - Marin, Napa, San Francisco, San Mateo, and Santa Barbara - were in the Top 10 during all years analyzed. Three counties that were not in the Top 10 each year - Orange, San Luis Obispo, and Yolo - consistently ranked in the Top 20. The ratio of patient care physicians to population required to rank in the Top 10 has increased over the past 25 years. In 1978, a county ranked in the Top 10 if the number of patient care physicians was greater than 169 per 100,000 persons. By 2002, a county had to have more than 233 patient care physicians per 100,000 persons to rank in the Top 10.

Similarly, some of the counties that were ranked in the Bottom 10 in 2002 were consistently ranked in the Bottom 10 throughout the 25-year period from 1978 to 2002. Three counties – Glenn, Modoc, and Yuba - were in the Bottom 10 each year and two counties – Alpine and Imperial – ranked in the Bottom 10 during six of the seven years analyzed. Two counties that did not consistently rank in the Bottom 10 - Calaveras and Sierra – consistently ranked in the Bottom 20. The threshold required for ranking in the Bottom 10 increased between 1978 and 2002, from less than 61 patient care physicians per 100,000 persons to less than 78 physicians per 100,000 persons, suggesting that some progress has been made toward increasing physician supply in these counties. Nevertheless, counties in the Bottom 10 continue to have much lower ratios of physicians to population than counties in the Top 10.

Some areas of California have such low ratios of generalist physicians to population that the federal government has designated them as Primary Care Health Professions Shortage Areas (HPSAs). In California, these designations are made at the sub-county level using Medical Services Study Areas (MSSAs) developed by the California Office of Statewide Health Planning and Development (http://www.ruralhealth.ca.gov/images/031201FrontierRuralUrbanMSSAs_Map.pdf.) The MSSAs are groups of census tracts that constitute rational service areas for primary care services. MSSAs that have less than one physician per 3,500 persons are eligible for designation as a Primary Care HPSA for the entire population. MSSAs can also be designated as Primary Care HPSAs for specific populations such as persons with low incomes, Medi-Cal beneficiaries, or farm workers.

Table 3.1
California Counties with the 10 Highest Ratios of Patient Care Physicians per 100,000 Persons

Year/Rank	1978	1980	1985	1990	1995	2000	2002
1st	San Francisco	San Francisco	San Francisco	San Francisco	San Francisco	Marin	Marin
2nd	Marin	Marin	Marin	Marin	Marin	San Francisco	San Francisco
3rd	Napa	Napa	Napa	Napa	Napa	Napa	Napa
4th	Santa Barbara	Santa Barbara	Santa Barbara	San Mateo	San Mateo	San Mateo	San Mateo
5th	Alameda	Alameda	Alameda	Santa Barbara	Yolo	Yolo	Yolo
6th	San Diego	Los Angeles	San Mateo	Orange	Santa Barbara	Santa Barbara	Santa Barbara
7th	Santa Clara	San Diego	San Diego	Alameda	Orange	San Diego	Shasta
8th	Los Angeles	Santa Clara	Los Angeles	Inyo	Santa Clara	Orange	Placer
9th	San Mateo	San Mateo	Santa Clara	Santa Clara	Placer	Placer	San Luis Obispo
10th	Yolo	Orange	Orange	San Diego	Sonoma	San Luis Obispo	Orange
Ratio of Physicians to Population in Top 10 Counties							
	< 169	< 173	< 200	< 206	< 212	< 224	< 233

Table 3.2
California Counties with the 10 Lowest Ratios of Patient Care Physicians per 100,000 Persons

Year/Rank	1978	1980	1985	1990	1995	2000	2002
58th	Alpine	Sierra	Modoc	Alpine	Alpine	Alpine	Alpine
57th	Solano	Modoc	Glenn	Glenn	Glenn	Glenn	Sierra
56th	Modoc	Glenn	Yuba	Modoc	Modoc	Sierra	Glenn
55th	Glenn	Del Norte	Tehama	Yuba	Yuba	Yuba	Yuba
54th	Del Norte	San Benito	Madera	Colusa	Lassen	Mariposa	Mariposa
53rd	Mono	Yuba	Imperial	Imperial	Colusa	Modoc	Colusa
52nd	San Benito	Madera	Lassen	Madera	San Benito	Colusa	Modoc
51st	Lake	Calaveras	Colusa	Calaveras	Imperial	Trinity	Imperial
50th	Madera	Tehama	Del Norte	Del Norte	Madera	Imperial	San Benito
49th	Yuba	Imperial	Alpine	Trinity	Calaveras	San Benito	Calaveras
Ratio of Physicians to Population in Bottom 10 Counties							
	> 61	> 80	> 92	> 90	> 75	> 75	> 78

Source: Petris Center analysis of the AMA Masterfile.

Thirty-seven of California's 58 counties had at least one MSSA that was designated as a Primary Care HPSA for the entire population in 2003. In many cases, the ratio of generalist physicians to population in the county overall was adequate but some areas within the county, typically rural areas or inner cities, had inadequate numbers of physicians. An additional 11 counties had at least one area of the county designated as a Primary Care HPSA for specific populations. Approximately two-thirds of California's Primary Care HPSAs are located in rural areas and the remaining one-third are located in urban areas. California's Primary Care HPSAs may not encompass all areas of the state that would be eligible for designation, because designations are not made automatically. For example, MSSAs that do not have health care facilities may not be designated, because applications for designation are typically made by health care facilities seeking to obtain federal and state resources for which HPSA designation is required. (Appendix D contains a complete list of Primary Care HPSAs in California as of August 2003.)

The California Department of Finance's population projections for California suggest that the state's population will grow most rapidly in areas of the state that have relatively low supplies of physicians.¹¹ The 10 counties whose populations are projected to have the fastest growth between now and the year 2020 are located in the Central Valley, Imperial Valley, and Inland Empire regions.¹² Eight of these 10 counties had ratios of physicians to population in the bottom third of all counties in 2002. In contrast, four of the counties with the lowest projected rates of population growth are in the San Francisco Bay Area, the region with the highest ratio of physicians to population (<http://ca.rand.org/stats/popdemo/popproj.html> California). These trends could exacerbate the geographic maldistribution of physicians in California unless physicians migrate to the areas of the state expected to experience the most rapid population growth.

HMO Penetration

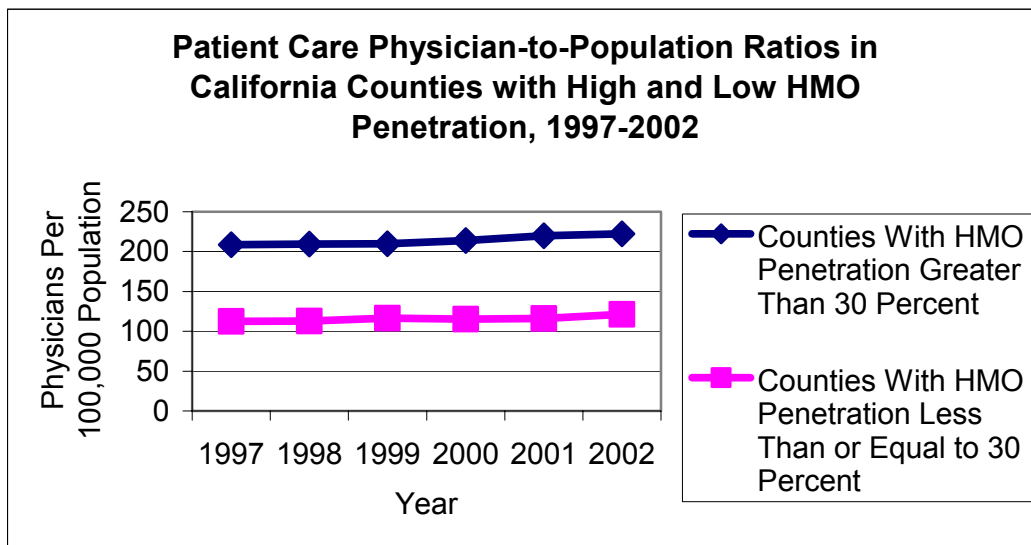
It may be possible to assert that HMOs are driving physicians out of California because they do not reimburse physicians adequately and restrict their professional

¹¹ These projections are consistent with Forte and colleagues' (2004) analysis of population projections from 2000 to 2015.

¹² The 10 counties are Colusa, Glenn, Imperial, Kern, Madera, Placer, Riverside, San Benito, San Bernardino, and San Joaquin.

autonomy (California Medical Association 2001). A common measure of the impact of HMOs is the HMO penetration rate in a county or other geographic area. HMO penetration is defined as the percentage of the total population that is enrolled in HMOs. As discussed in Chapter 1, the total number of physicians in California has not decreased, despite the rapid growth in HMO penetration over the past 25 years. In addition, areas of California with high rates of HMO penetration also have higher ratios of patient care physicians to population than areas with low rates of HMO penetration. As Figure 3.4 illustrates, in 1997 counties with HMO penetration greater than 30% had almost twice as many patient care physicians per 100,000 persons as counties with HMO penetration less than or equal to 30%. Moreover, physician supply has increased in counties with high rates of HMO penetration since 1997. Between 1997 and 2002, the ratio of patient care physicians to population increased in counties with high rates of HMO penetration, rising from 209 patient care physicians per 100,000 persons in 1997 to 222 patient care physicians per 100,000 persons in 2002.

Figure 3.4



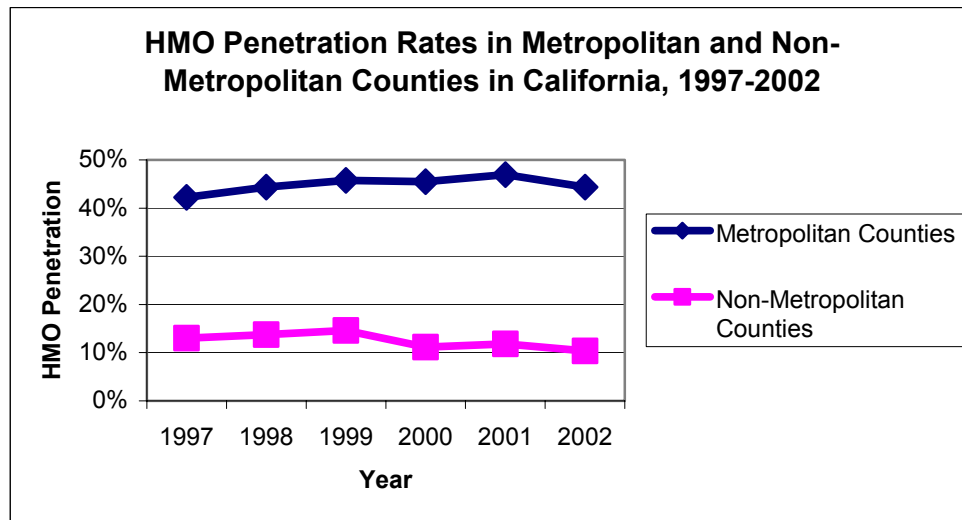
Sources: Petris Center analysis of the AMA Masterfile and data from Cattaneo and Stroud, Inc.

Metropolitan and Non-Metropolitan Areas

The lack of impact of HMO penetration on physician supply trends may reflect the fact that HMO penetration is much higher in metropolitan areas than in non-

metropolitan areas of California. As Figure 3.5 indicates, between 1997 and 2002 over 40% of the population in California's metropolitan counties was enrolled in HMOs, whereas in non-metropolitan counties HMO penetration ranged from 10% to 15% (Cattaneo and Stroud 2003). HMO enrollment has fallen in non-metropolitan areas over the past several years due to the withdrawal of commercial and Medicare HMOs from many of these areas (California Legislative Analyst's Office 2002).

Figure 3.5

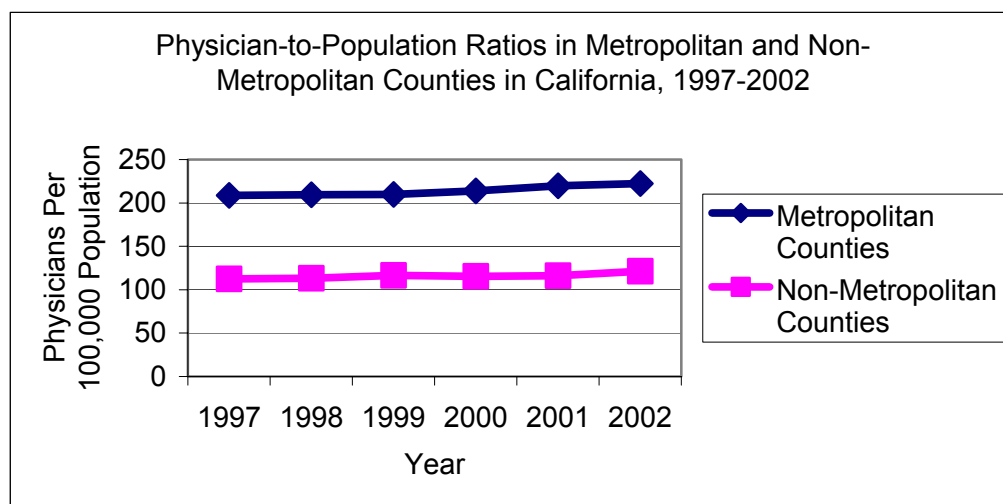


Source: Petris Center analysis of data from Cattaneo and Stroud, Inc.

Historically, non-metropolitan areas of California and other states have had lower ratios of physicians to population than metropolitan areas (US GAO 2003, COGME 1998, Newhouse et al 1982). Non-metropolitan areas often have difficulty recruiting and retaining physicians due to a lack of competitive compensation, career opportunities for physicians' spouses, and cultural and recreational amenities (COGME 1998, Connor, Hillson, and Krawelski 1995, Cooper et al. 1975, Langwell et al. 1987, Leonardson, Lapierre, and Hollingsworth 1985, Morrissey, Kletke, and Marder 1991). A large percentage of the population in many non-metropolitan areas is either uninsured or enrolled in Medi-Cal (California's Medicaid program), which limits physicians' potential earnings (COGME 1998). Some non-metropolitan areas do not have hospitals, and those that are available are usually small, and may not have the latest diagnostic and therapeutic equipment (Coffman, Rosenhoff, and Grumbach 2002).

Figure 3.6 displays trends in the ratio of patient care physicians to population in both metropolitan and non-metropolitan counties in California. Metropolitan counties have almost twice as many physicians per 100,000 persons as non-metropolitan counties. In 2002, metropolitan counties had an average of 222 patient care physicians per 100,000 persons, whereas non-metropolitan areas had an average of 121 patient care physicians per 100,000 persons. This figure suggests that any effects of HMO penetration have not been of sufficient magnitude to reduce the differences in physician supply in metropolitan and non-metropolitan areas.

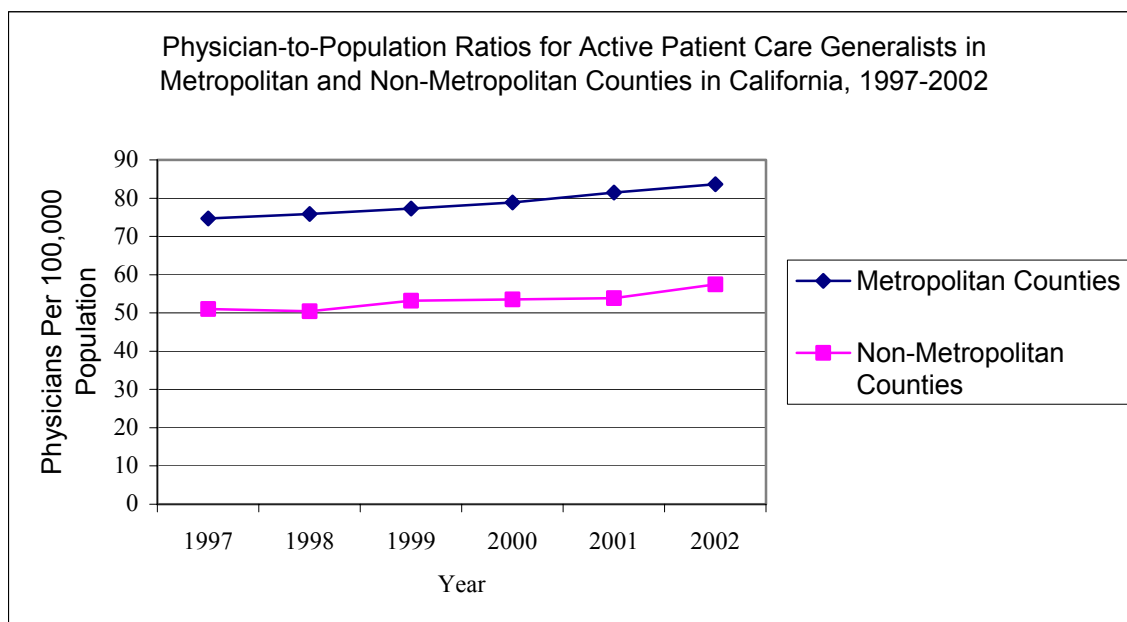
Figure 3.6



Source: Petris Center analysis of the AMA Masterfile.

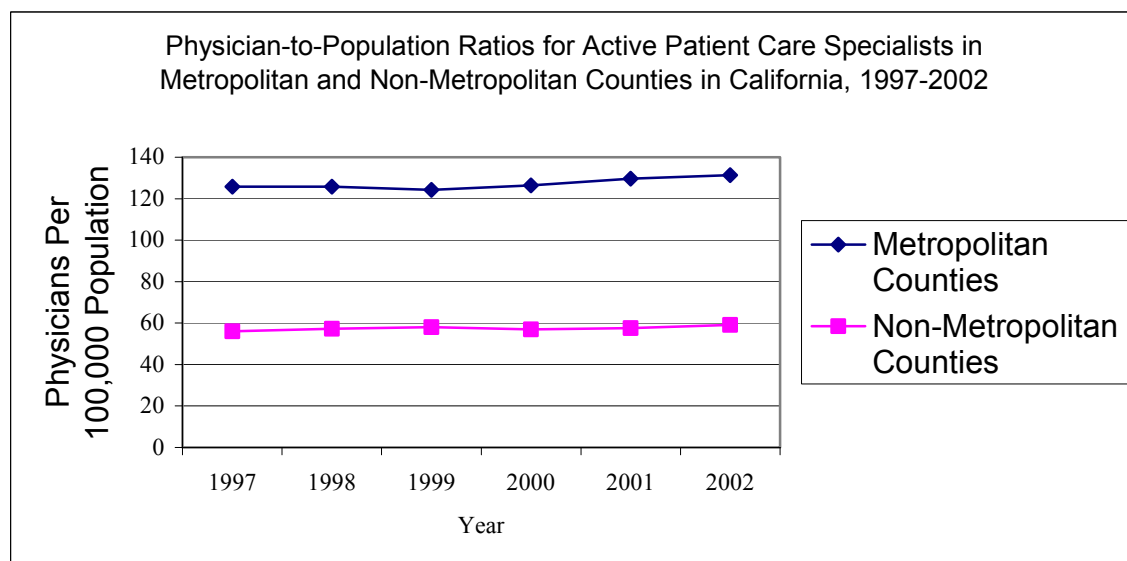
As Figures 3.7 and 3.8 illustrate, the gap between the supply of physicians in metropolitan and non-metropolitan areas is more pronounced for specialists than for generalists. In 2002, metropolitan areas had over twice as many specialists per 100,000 persons as non-metropolitan areas, but only 30% more generalists per 100,000 persons. These findings are consistent with a recent U.S. General Accounting Office report on the geographic distribution of physicians in the United States overall (US GAO 2003).

Figure 3.7



Source: Petris Center analysis of the AMA Masterfile.

Figure 3.8



Source: Petris Center analysis of the AMA Masterfile.

To a large extent the difference in ratios of specialists to population between metropolitan and non-metropolitan counties in California reflects differences in the number of persons living in these counties. Specialists require a larger population base to build a practice than generalists, because only a portion of the population requires their services. Many communities in non-metropolitan counties are too small to support

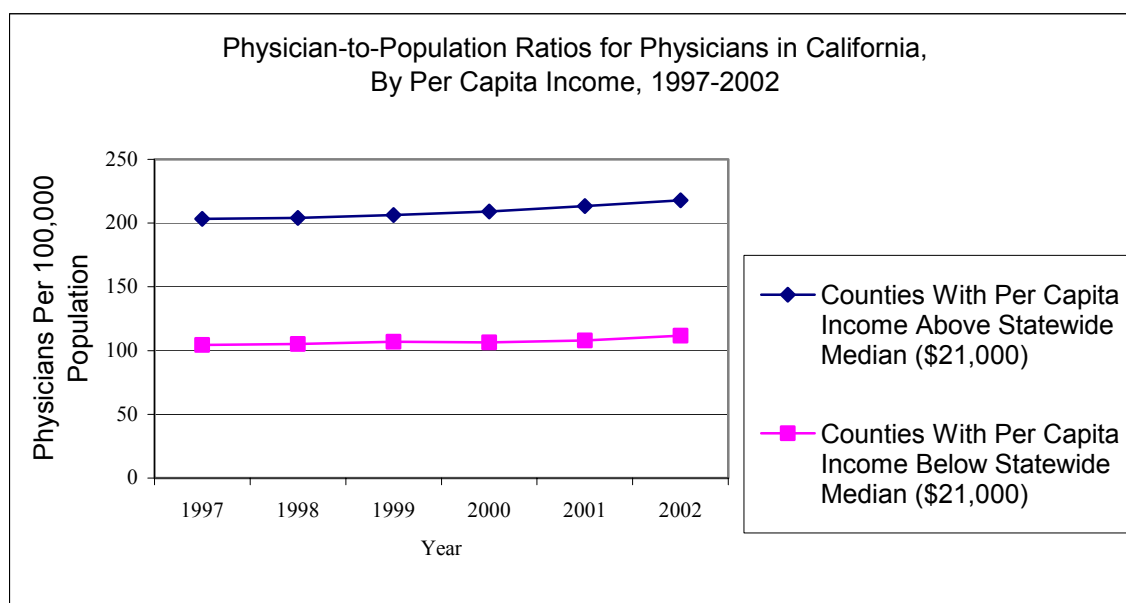
specialists, particularly sub-specialists who specialize in a narrow range of diseases or treatments (e.g. nephrologists, plastic surgeons). Nevertheless, many non-metropolitan areas that could support both generalists and specialists with a relatively broad scope of practice, such as general surgeons, have inadequate numbers of physicians.

Per Capita Income

Physician-to-population ratios also vary with local economic conditions, because the local economy affects demand for medical care. Persons who live in areas with strong economies are more likely to be employed and typically earn higher incomes than persons living in areas with poor economic conditions. They are also more likely to have health insurance. Persons who have health insurance consume more health care services than uninsured persons because their out-of-pocket costs are lower. Greater demand for health care services, in turn, generates greater demand for physician services.

One common measure of local economic conditions is per capita income. Previous studies have found that areas of the United States in which per capita income is high have higher ratios of physicians to population than areas in which per capita income is low (Benham et al. 1968, Escarce et al. 2000, Feldman 1979, Jiang and Begun 2002). Our study finds consistent trends in California. Figure 3.9 illustrates physician supply trends in counties in which per capita income is above or below \$21,000, which was the median per capita income for all California counties in 1997. Counties with per capita incomes above the median had twice as many patient care physicians per 100,000 persons as counties with per capita incomes below the median. Some of the counties in California that are projected to experience the most rapid population growth have relatively low per capita incomes, which may make it difficult for health care organizations in these areas to recruit sufficient numbers of additional physicians to meet new residents' needs.

Figure 3.9



Source: Petris Center analysis of the AMA Masterfile and RAND California Statistics.

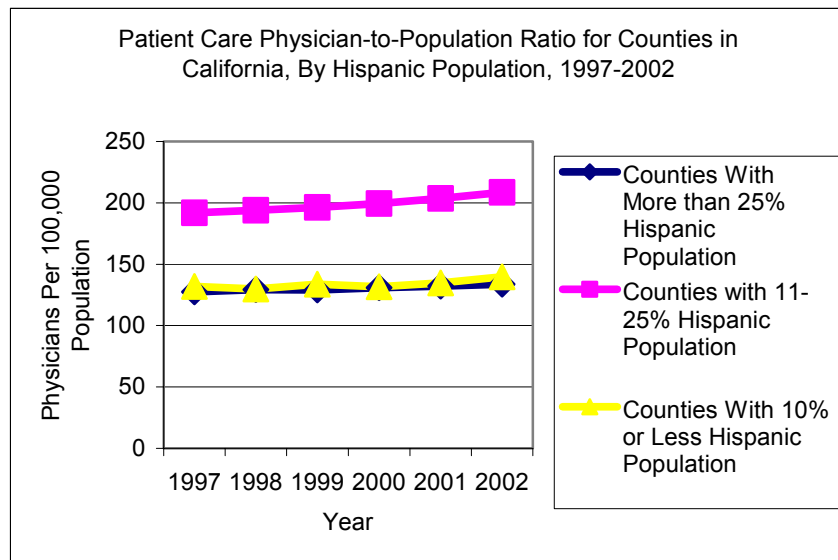
Race/Ethnicity

California is one of the most racially/ethnically diverse states in the U.S.. However, the distribution of racial/ethnic groups varies widely across the state. Some areas of California have high percentages of Hispanic, African-American, Asian-Pacific Islander, and/or Native American residents, whereas in other areas the population is predominantly white. For example, large metropolitan areas in Northern and Southern California have the highest percentages of African-Americans and Asian-Pacific Islanders. The Central Valley, Imperial Valley, and Southern California have the highest percentages of Hispanics.

Previous studies that analyzed physician supply in California at the sub-county level have found that areas that have high percentages of African-Americans and Hispanics are more likely to have shortages of physicians (Komaromy et al. 1996, Pathman, Konrad, and Schwartz 2002). Figure 3.10 displays county level data on the ratio of patient care physicians to population in California counties that have high,

middle, and low percentages of Hispanic residents.¹³ Counties in which the percentage of Hispanic residents ranges from 11% to 25% have higher ratios of patient care physicians to population than counties in which more than 25% of the population is Hispanic or in which 10% or less of the population is Hispanic. Similar patterns are observed for specialist physicians. With regard to generalist physicians, we find that counties in which more than 25% of the population is Hispanic have lower ratios of generalist physicians to population than all other counties (see Figure 3.11). The ratio of generalist physicians to population in these counties is lower than the minimum ratio of 60 generalists per 100,000 population recommended by the Council on Graduate Medical Education (1996).

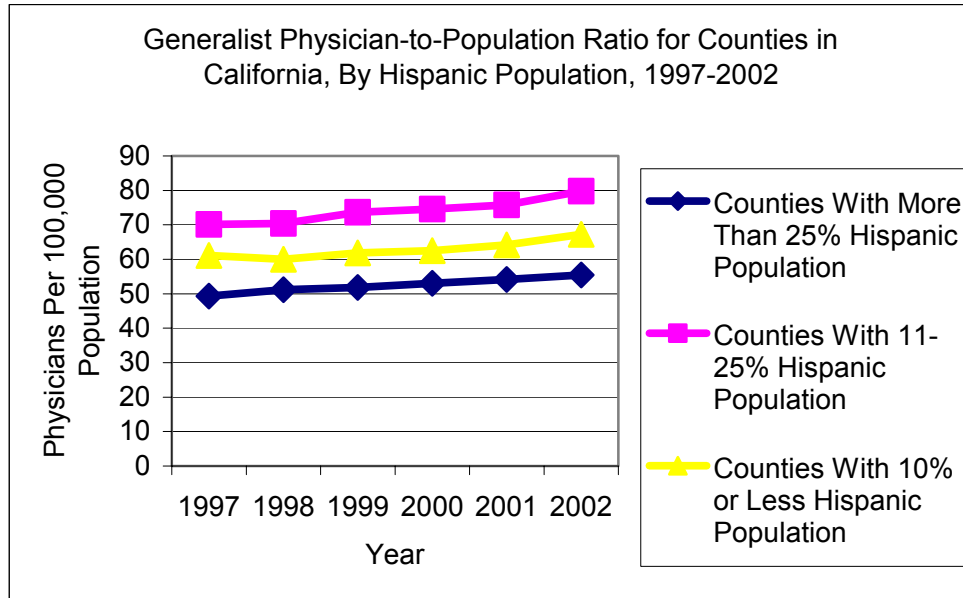
Figure 3.10



Sources: Petris Center analysis of the AMA Masterfile and data from the California Department of Finance.

¹³ We do not display similar graphs for African-Americans because a large percentage of California's African-American population resides in a small number of urban counties in the San Francisco Bay Area and Southern California.

Figure 3.11



Sources: Petris Center analysis of the AMA Masterfile and data from the California Department of Finance.

The difference between our findings and those of previous studies of the relationship between population race/ethnicity and physician supply reflects our use of county level data. Most California counties in which the Hispanic population is either low or high relative to other counties have lower per capita incomes than counties whose percentage of Hispanics falls in the middle group of counties. Thus, it is not surprising that these two groups of counties have lower ratios of physicians to population than counties in the middle group. Moreover, in large counties the percentage of the population that is Hispanic varies widely across cities, towns, and neighborhoods. As a consequence, studies that examine sub-county geographic areas may yield more precise information about the relationship between physician supply and the race/ethnicity of the population than our assessment of county level data. Regardless of whether counties or sub-county areas are analyzed, areas with high percentages of Hispanics frequently have insufficient numbers of physicians (particularly generalists), which may contribute to racial/ethnic disparities in health status and utilization of health care services.

Conclusions and Policy Recommendations

California's physicians are not adequately distributed across the state. Some counties have ample numbers of physicians, whereas others have severe shortages. Non-metropolitan counties and counties with low per capita incomes have the least adequate supplies of physicians. Counties with high percentages of Hispanic residents have insufficient numbers of generalist physicians. Many persons who live in counties with physician shortages must travel long distances to obtain medical care because many of these counties are in relatively remote areas of the state.

Some experts have predicted that market forces would resolve shortages of physicians in non-metropolitan areas (Newhouse et al. 1982). They hypothesized that increases in the number of physicians in metropolitan areas would increase competition for patients, which would lead some physicians to pursue career opportunities in non-metropolitan areas and thereby increase the supply of physicians in non-metropolitan areas. HMOs have taken advantage of growth in the number of physicians in metropolitan areas by paying physicians less and regulating the amount and types of services physicians provide enrollees. One might expect such changes in reimbursement and professional autonomy to lead new physicians to practice in non-metropolitan areas and lead some established physicians to relocate to these areas. Contrary to these expectations, the gap between physician supply in metropolitan and non-metropolitan counties in California has not narrowed from 1997 to 2002. Metropolitan counties continue to have twice as many physicians per 100,000 persons as non-metropolitan areas.

However, there is evidence that suggests that market forces are reacting to solve some of the needs-based shortfalls of physicians in areas that are predominantly Hispanic. Brown et al. (2004) has found that the earnings of Hispanic physicians (relative to non-Hispanic physicians) are higher in areas that have large Hispanic populations, but few Hispanic physicians.¹⁴ Over time, these higher earnings, which indicate local shortages of Hispanic physicians, should attract Hispanic physicians to

¹⁴ This study analyzed national data from the 1998-99 and 2000-01 waves of the Community Tracking Study Physician Survey, the 1998-99 and 2000-01 waves of the Community Tracking Study Household Survey, and data from the U.S. Census. It employed advanced multivariate techniques which controlled for both individual-level and market-level confounders.

these areas. However, this can only occur if there are adequate overall supplies of Hispanic physicians. Without adequate supplies, local shortages of Hispanic physicians will persist. Since the proportion of physicians who are Hispanic is much lower than the proportion of the general population that is Hispanic, policies to increase the number of physicians who are fluent in the appropriate languages and understand Hispanic cultures remain important.¹⁵

Our findings suggest that policymakers should continue to support policies and programs aimed at increasing access to physician services in communities that have inadequate supplies of physicians. These policies and programs may be divided into three major types of strategies: 1) efforts to increase the number of physicians in underserved areas, 2) alternative methods of delivering health care services to persons living in underserved areas, and 3) expansion of health insurance. Efforts to increase the number of physicians in underserved areas encompass policies and programs that seek to increase the number of medical students and medical residents interested in practicing in underserved areas and to provide financial incentives for practice in underserved areas (Grumbach et al. 1999). Examples of such policies and programs include the Area Health Education Centers (AHEC) program, the Shortage Area Medical Education and Training Program, the Song-Brown Family Physician Training Program, and loan repayment programs administered by the California Medical Board and the Office of Statewide Health Planning and Development (OSHPD). In addition, job-listing services sponsored by state government and non-profit organizations could be expanded to include databases of physicians interested in practicing in underserved areas and placement services for clinics, hospitals, medical groups, and other providers in these areas. Policymakers could also develop targeted initiatives to increase the number of medical students from underserved rural and urban areas, because such individuals are more likely to practice in underserved areas (Coffman, Rosenoff, and Grumbach 2002, Grumbach et al. 1999, Rabinowitz et al. 2000).

A second category of policies and programs encompasses alternative means for providing medical care to persons who live in underserved areas, such as utilization of

¹⁵ Brown et al. (2004) found similar results for Black physicians. They found that the earnings of Black physicians (relative to non-Black physicians) are higher in areas that have large Black populations who are insured by Medicaid or other public insurance programs but have few Black physicians.

non-physician clinicians and development of telemedicine services and other information technologies. Non-physician clinicians, such as certified nurse midwives (CNMs), nurse practitioners (NPs), and physician assistants (PAs), can provide many of the same services as physicians. (The contributions of NPs and PAs to patient care are discussed in Chapter 5.) Examples of programs that promote the use of non-physician clinicians in underserved areas include NP and PA training grants administered by the AHEC and Song-Brown programs, and scholarship and loan repayment programs administered by OSHPD and the Health Professions Education Foundation.

Telemedicine services utilize telecommunications technology to link patients and clinicians in isolated areas with clinicians in other health care facilities. For example, the Northern Sierra Rural Health Network has installed telemedicine and video conferencing equipment in 24 health care facilities in Northeastern California, enabling patients and clinicians in remote, rural areas to obtain consultations from specialists at the University of California, Davis Medical Center and other tertiary medical centers (<http://www.nsrhn.org/Telemedicine/telemedicine.html>). Supporting telemedicine is a particularly appropriate strategy for improving access to subspecialty medical care in non-metropolitan areas, because the populations of many of these areas are too small to support subspecialists. Telemedicine consultations reduce the need for patients in such communities to travel long distances to obtain subspecialty care. Policy options for supporting telemedicine include grants and subsidies for the development of telemedicine infrastructure and reimbursement for telemedicine services.

Expansion of health insurance constitutes a third option for improving access to medical care for persons in underserved areas. A high percentage of the population living in underserved areas is uninsured. Increasing health insurance coverage in these communities could improve physician recruitment and retention because physicians and organizations that employ them would have greater revenue. Options include tax deductions for purchase of health insurance, expansion of public health insurance programs, such as Medi-Cal and Healthy Families, and employer mandates, such as SB 2.

CHAPTER 4: DO CALIFORNIA'S PHYSICIANS REFLECT ITS POPULATION?

Numerous studies have documented racial/ethnic disparities in health status and utilization of health care services in California and other states (Kingston, Tisnado, and Carlisle 2001). Racial/ethnic disparities are of particular concern in California, because it is one of the most racially and ethnically diverse states in the nation. Previous studies suggest that increasing racial/ethnic diversity in the medical profession may help to reduce these disparities (Cooper-Patrick et al. 1999, Laveist and Nuru-Jeter 2002, LaVeist et al. 2003, Saha et al. 1999).

African-American and Hispanic physicians play an important role in reducing racial/ethnic disparities in health status and access to care, because they provide a disproportionate amount of care to persons from their own racial/ethnic groups (Cantor et al. 1996, Keith et al. 1985, Komaromy et al. 1996, Moy, Bartman, and Weir 1995). Their disproportionate contribution results in part from their greater willingness to practice in African-American and Hispanic communities. African-American and Hispanic physicians are more likely than white physicians to practice in communities with high percentages of African-American or Hispanic residents (Fryer et al. 2001, Komaromy et al. 1996). These physicians reduce the time and travel expenses associated with obtaining medical care, which may increase the likelihood that African-American and Hispanic residents will seek care before health problems become acute.

In addition, several studies have found that racial/ethnic concordance between physicians and patients improves patient satisfaction (LaVeist and Nuru-Jeter 2002, Saha et al. 1999). Greater satisfaction may increase patients' willingness to seek care and comply with treatment regimens. In fact, LaVeist et al. (2003) found that racial/ethnic concordance resulted in patients being more likely to seek needed care and being less likely to postpone or delay seeking care. Patients whose physicians share the same race/ethnicity also report their visits as more participatory (Cooper-Patrick et al. 1999), which may indicate better doctor-patient communication, which may, in turn, improve diagnosis and treatment. Racial/ethnic concordance can also improve communication for patients who do not speak English, because physicians from the same racial/ethnic group may be able to communicate with them in their own language and are more likely to understand cultural factors that affect patients' beliefs about the causes of illness and the

efficacy of medical care. According to Brown et al. (2004), patients seem to value racial/ethnic concordance to such a large extent that African-American and Hispanic physicians receive higher earnings per hour in areas where they are in short supply relative to the racial/ethnic composition of the population.¹⁶ Collectively, these findings suggest that policymakers who seek to reduce racial/ethnic disparities in health care in California should monitor trends in the race/ethnicity of the state's physicians.

Race and Ethnicity of California's Population

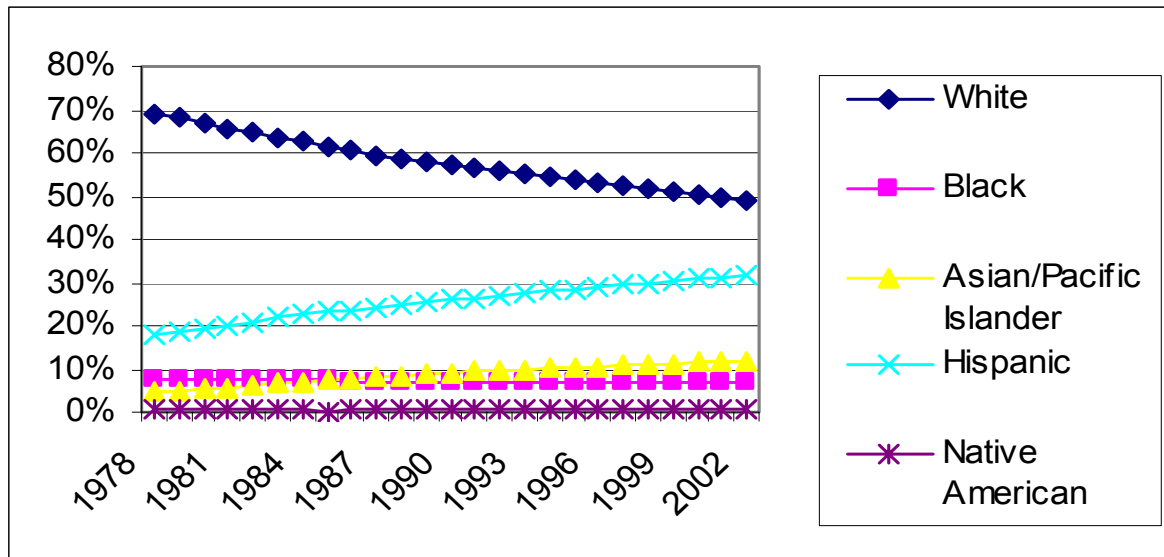
The racial/ethnic composition of California's population changed significantly over the past 25 years (see Figure 4.1). In 1978 the state's population was almost 70% white,¹⁷ but by 2002 the proportion of whites had fallen to only about half of the population. Conversely, the state's Hispanic and Asian/Pacific Islander populations have grown rapidly. California's Hispanic population grew from 18% in 1978 to comprise roughly 32% of the state's population in 2002. Meanwhile the state's Asian/Pacific Islander population grew from 5% in 1978 to 12% in 2002. In contrast, California's Black and Native American populations remained largely unchanged. Blacks and Native Americans consistently represented about 7% and 1% of the population, respectively, over the period.

Immigration to California from other countries accounts for much of the growth in Hispanics and Asian/Pacific Islanders. California has the highest percentage of foreign-born residents of any state. Twenty-six percent of the state's residents are foreign born, compared to 11% of the overall U.S. population (Forte et al. 2004). Most of California's foreign-born residents are from Mexico and Asian countries. Immigrants from Mexico account for 44% of foreign-born Californians and immigrants from Central and South America account for an additional 10%. Thirty-two percent of foreign-born Californians are from Asia (Forte et al. 2004).

¹⁶ See the Conclusions and Policy Recommendations section of Chapter 3 for a larger discussion of this study.

¹⁷ Throughout this chapter, physicians described as "white" are technically white, non-Hispanic and physicians described as "Black" are technically Black, non-Hispanic. These definitions are consistent with the categorization in the data. We use the terms "Black" (which is used by the U.S. Census Bureau) and "African-American" interchangeably.

Figure 4.1
Race and Ethnicity of California's Population, 1978-2002



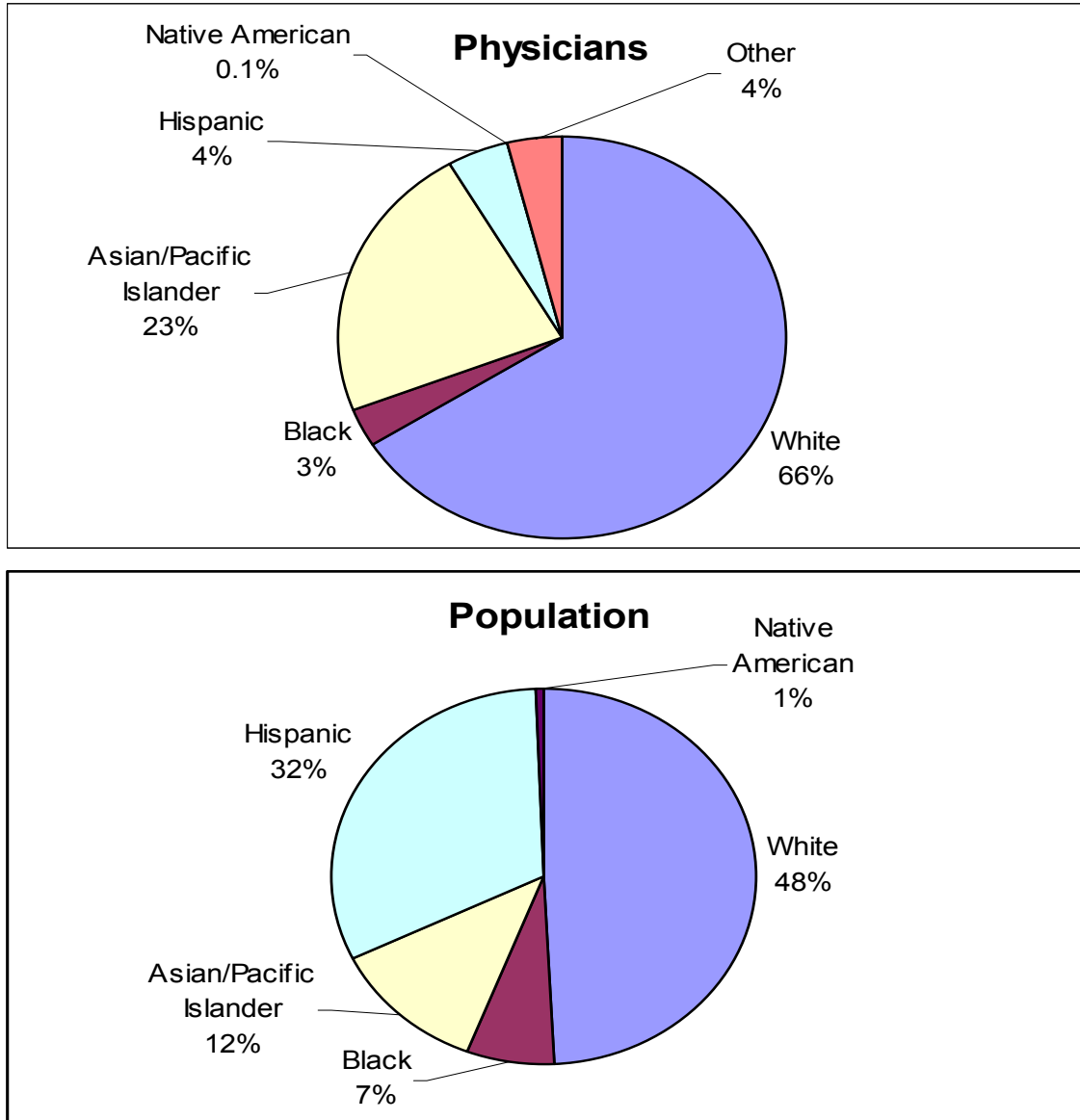
Source: Petris Center analysis of data from the California Department of Finance.

Race and Ethnicity of California's Physicians

Figure 4.2 illustrates the racial/ethnic composition of California's active patient care physicians in 2002 and compares it to the state's population. The graphs show that the racial/ethnic mix of physicians differs significantly from the racial/ethnic mix in the state's population. In 2002, two-thirds of the doctors in the state were white and nearly one-quarter were Asian/Pacific Islander, versus 48% and 12% of the population, respectively. Figure 4.2 also shows that only 4% of the active patient care physicians were Hispanic, whereas the state's population is nearly one-third Hispanic. Three percent of the state's active patient care physicians were Black, which is also proportionally less than the Black population in the state (7%). The percentages of physicians who are Black or Hispanic have not changed since the mid-1990s (Coffman et al. 1996). Native American physicians made up only 0.1% of the state's active patient care physicians, compared to 1% of its population.¹⁸

¹⁸ The U.S. Census for 2000 also collects data on the race/ethnicity of physicians. The category includes all employed physicians, including medical residents. The breakdown of race/ethnicity for California physicians is as follows: White 69%; Black 3%, Asian/Pacific Islander 20%, Hispanic 6%, Native American <.01%, Other 2%.

Figure 4.2
Race/Ethnicity of California's Population and Active Patient Care Physicians, 2002



Source: Petris Center analysis of data from the California Department of Finance and the AMA Physician Masterfile, 2002.

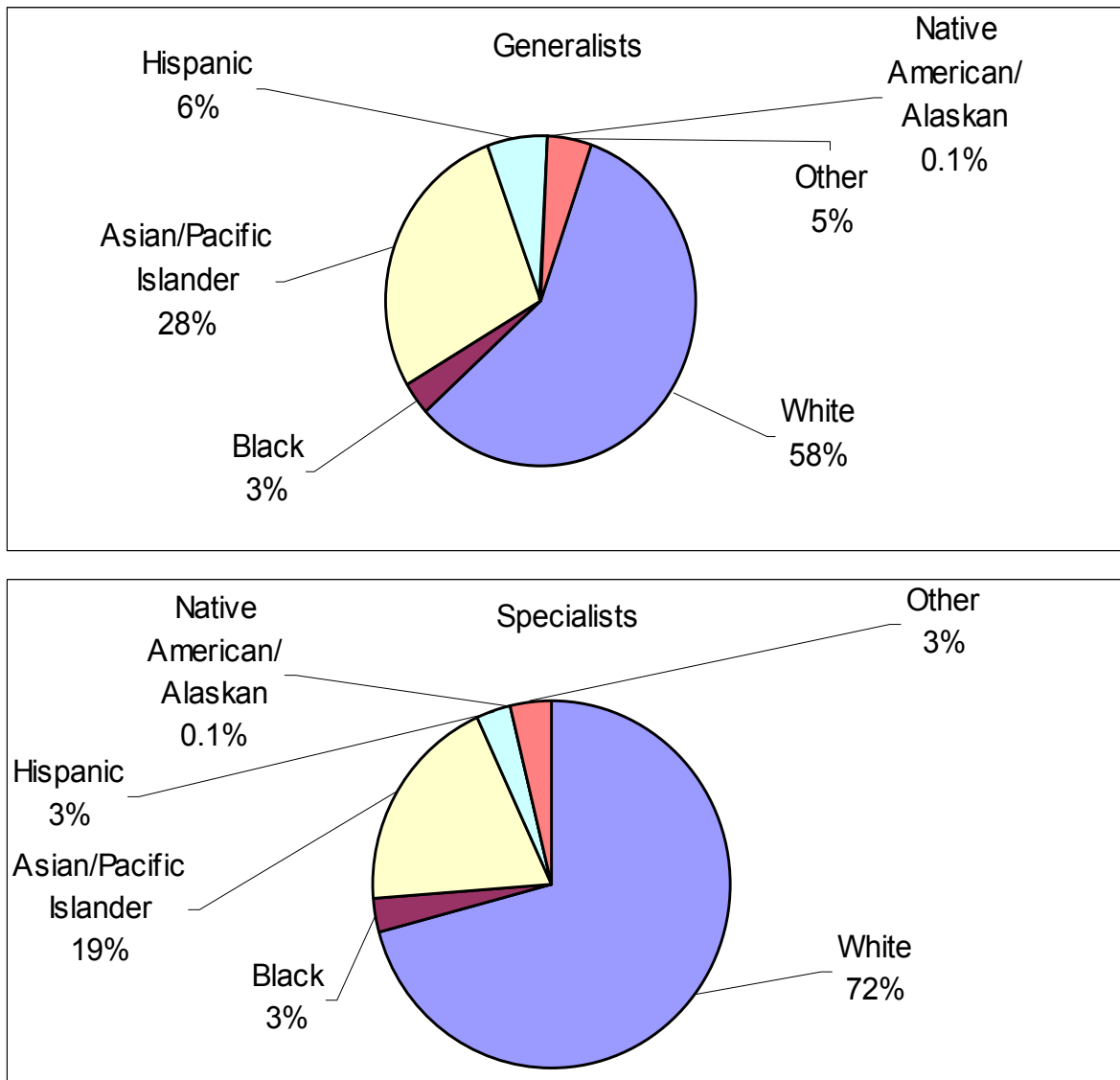
Note: Racial/ethnic categories taken from the AMA Physician Masterfile. Physicians with racial/ethnic groups coded as “Missing” or “Unknown” were excluded.

Race/Ethnicity of California's Physicians by Specialty

Racial/ethnic groups are represented in different proportions among generalist and specialist physicians. Generalist physicians were 58% white, while Asian/Pacific Islanders and Hispanics comprised 28% and 6% of generalist physicians, respectively. Conversely, 72% of specialist physicians were white. Specialists had much lower

proportions of Asian/Pacific Islander (19%) and Hispanic (3%) physicians than generalist physicians. Black physicians made up 3% of both generalist and specialist physicians in California. Thus, generalists are slightly more representative of the racial/ethnic diversity of the state's population than specialists. However, Blacks, Hispanics, and Native Americans remain underrepresented among both generalists and specialists.

Figure 4.3
Race and Ethnicity of California's Active Patient Care Physicians By Major Specialty Group, 2002



Source: Petris Center analysis of the AMA Physician Masterfile, 2002

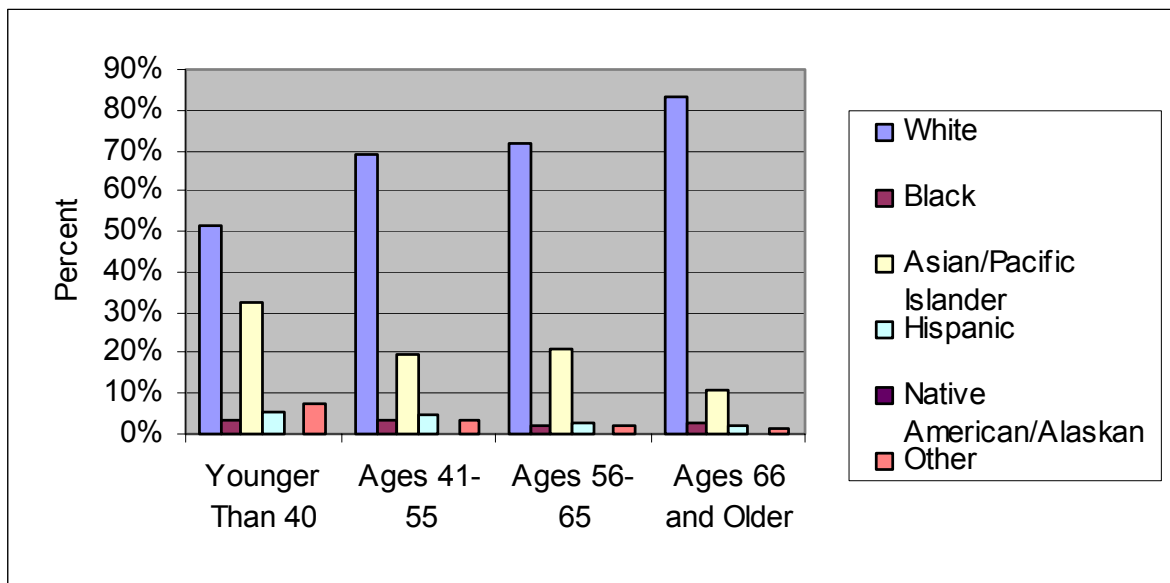
Note: Racial/ethnic categories taken from the AMA Physician Masterfile. Physicians with racial/ethnic groups coded as "Missing" or "Unknown" were excluded.

Race/Ethnicity by Age Group

Although younger physicians in California are more racially/ethnically diverse than older physicians, some racial/ethnic groups remain underrepresented. Figure 4.4 presents racial/ethnic distributions among active patient care physicians in California by age group. Among physicians aged 40 and younger, white physicians represented 51% of the physician population in 2002. In this age group, Asian/Pacific Islander physicians composed 32% of the physician population. However, Hispanic physicians made up only 5% of physicians in the youngest group, a percentage far smaller than the percentage of Hispanics in the population. In each older age group, the active patient care physician population was increasingly homogeneous and contained smaller proportions of Asian/Pacific Islander and Hispanic doctors. Black physicians were somewhat better represented in the younger age groups, but they did not comprise more than 3% of the physician population among any of the age groups.

Figure 4.4

**Race and Ethnicity of Active Patient Care Physicians in California
By Age Group, 2002**



Source: Petris Center analysis of the AMA Physician Masterfile, 2002

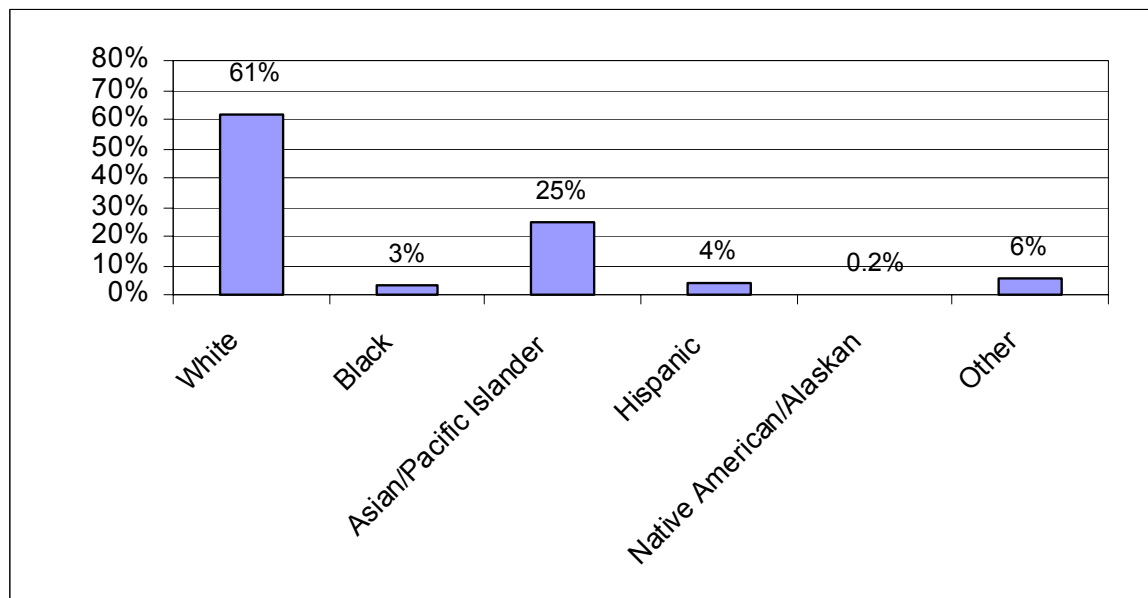
Note: Racial/ethnic categories taken from the AMA Physician Masterfile. Physicians with racial/ethnic groups coded as "Missing" or "Unknown" were excluded.

Racial and Ethnic Distribution of California's Medical Residents

Data regarding the race/ethnicity of California's medical residents and medical students provides insights into the future of California's physician workforce because many of California's medical residents and medical students go on to practice in California (Coffman et al. 2001, Seifer et al. 1995). According to Figure 4.5, the majority of California's medical residents are white and approximately one-quarter are Asian/Pacific Islanders. As with the physician population, a disproportionately low number of medical residents are Hispanic and African-American. Native Americans comprise less than 1% of all medical residents in California.

Figure 4.5

Race and Ethnicity of California's Medical Residents, 2002



Source: Petris Center analysis of the AMA Physician Masterfile, 2002

Note: Racial/ethnic categories taken from the AMA Physician Masterfile. Physicians with racial/ethnic groups coded as "Missing" or "Unknown" were excluded.

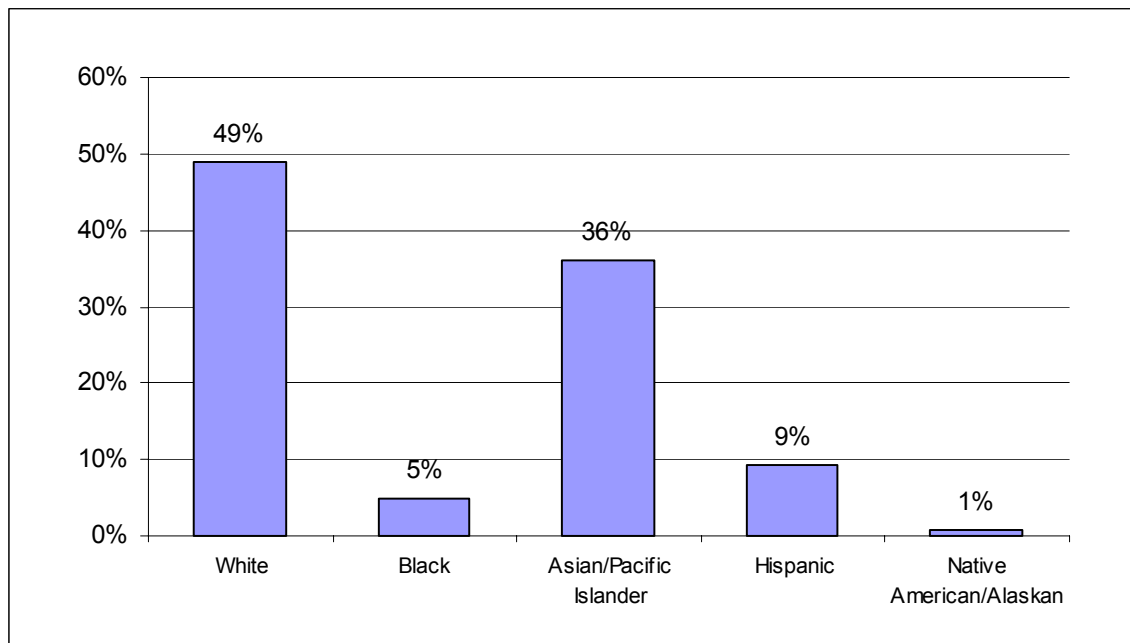
Race and Ethnicity of Medical School Graduates in California and the United States

Graduates of California's medical schools are more racially/ethnically diverse than the state's overall physician workforce, which includes many doctors trained in other states and countries. First, in Figure 4.6, we see that white non-Hispanics constitute just under half (49%) of the medical school graduates in the state. Second, Asian/Pacific Islanders were more than 35% of total graduates. Finally, Hispanic, Black, and Native

American medical school graduates made up a greater proportion of graduates than of the overall physician population. Although these data are encouraging, the proportions of Hispanics and Blacks among medical graduates remain lower than their proportions in the state's population.

Figure 4.6

Race and Ethnicity of Graduates of California Medical Schools, 2001



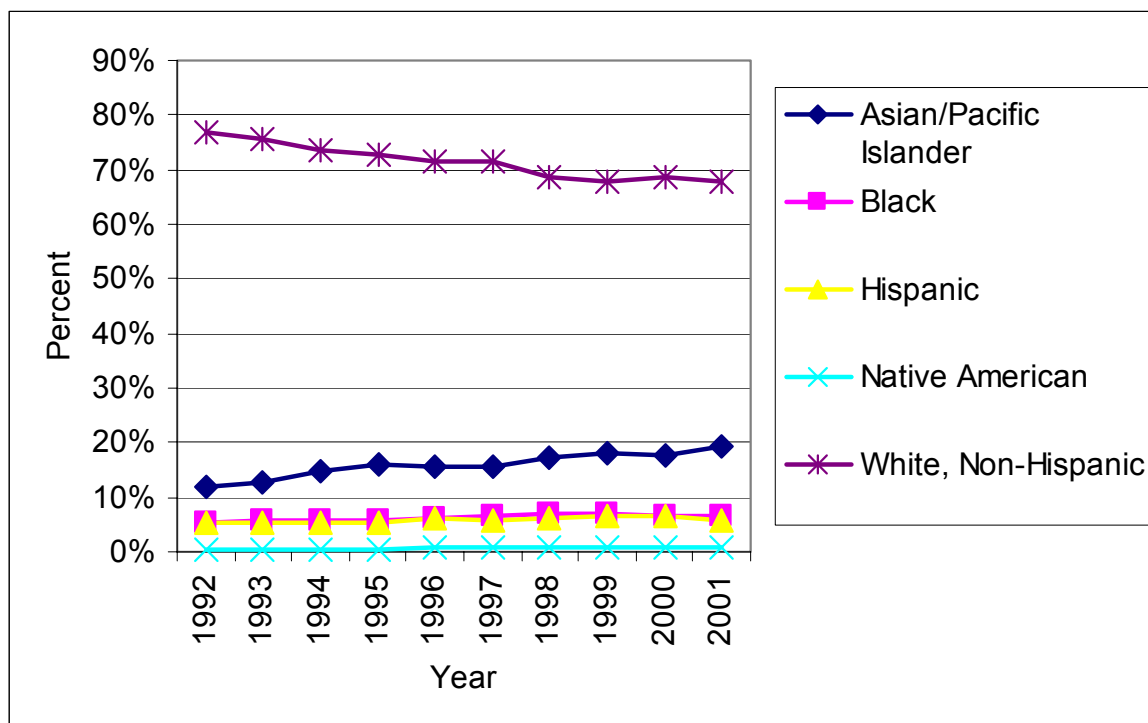
Source: Petris Center analysis of data from the Association of American Medical Colleges, 2002

Note: Racial/ethnic categories taken from the AAMC. Hispanic combines the following categories: Mexican-American, Mainland Puerto Rico, Commonwealth of Puerto Rico, and other Hispanic.

Nevertheless, California's medical school graduates appear to be much more diverse than their peers across the country. Figure 4.7 illustrates how the race/ethnicity of medical school graduates has changed in the United States from 1992 to 2001. Consistent with previous studies (Dower 2001), we find that the number of white graduates decreased, whereas the number of Asian/Pacific Islander graduates increased. The percentages of Asian/Pacific Islander and Hispanic graduates were lower among total U.S. graduates than among California graduates.

Figure 4.7

Race and Ethnicity of Graduates of U.S. Medical Schools, 1992-2001



Sources: Petris Center analysis of data from the AAMC, 2002 and the AACOM, 2002

- Notes:
1. Racial/ethnic categories from the AAMC and AACOM reports.
 2. Includes graduates of both allopathic and osteopathic medical schools.
 3. Excludes graduates whose race/ethnicity is unknown (0.5% to 7% depending on year)
 4. Excludes graduates who are not U.S. citizens or permanent residents (0.5% to 2% depending on year)

Conclusions and Policy Recommendations

Analysis of the racial/ethnic distribution of active patient care physicians in California reveals that physicians in the state do not mirror the racial/ethnic diversity of the state's population. The disparity is particularly evident among Blacks, Hispanics, and Native Americans, who are significantly underrepresented among physicians. Despite these important shortcomings, our analysis reveals that younger physicians and medical students are more racially/ethnically diverse than older physicians.

It is important to note that the racial/ethnic category "Asian/Pacific Islander" contains physicians of a wide array of national and ethnic backgrounds, which the AMA codes as one group. Although the overall number of Asian/Pacific Islander physicians is sizable and has increased in recent years, this growth may mask the under-representation

of some ethnic groups within this broad category, particularly those composed primarily of recent immigrants.

Improving racial/ethnic concordance between California's physicians and its population will require a large increase in the number of doctors from underrepresented racial/ethnic groups. Although Proposition 209 prohibits consideration of race/ethnicity as a factor in medical school and residency admissions, other policy options are available to address this challenge. First, state policy makers can make a more concerted attempt to attract racially/ethnically diverse physicians to the state. Such policies can vary from expanded recruitment efforts to scholarship loan repayment programs for physicians with linguistic skills and cultural knowledge required by patients from underrepresented racial/ethnic groups. Second, California can try to achieve greater racial/ethnic diversity among its medical residents. The residents would not only provide an important element of care in the state; research suggests that they are also likely to stay in California to practice after their residency (Seifer et al. 1995, Coffman et al. 2001). Finally, California can attempt to influence the racial/ethnic distribution of physicians further upstream, by encouraging more students from underrepresented groups to attend medical school in the state, or by increasing the number of underrepresented minority Californians eligible for medical school.

Examples of the latter approach include numerous outreach programs established by the University of California and other colleges and universities.¹⁹ Outreach programs encompass programs targeted toward K-12 students, undergraduate college students, and students admitted to or enrolled in medical school (University of California Office of the President, March 2003). At the elementary school level, outreach programs encompass presentations to students about careers in medicine, campus tours, and science curriculum enrichment. Programs at the secondary school level include academic enrichment,

¹⁹ Much of the material cited in this paragraph was obtained from reports issued by the University of California Office of the President. These reports provide a general overview of outreach programs as well as descriptions of outreach programs provided by University of California medical schools. Other medical schools in California operate similar programs. Information about outreach programs at the Loma Linda School of Medicine, the Stanford School of Medicine, and the Keck School of Medicine of the University of Southern California may be found on the schools' web sites (<http://www.llu.edu/medicine/minority/links.html>, <http://med.stanford.edu/community/diversity/>, <http://www.usc.edu/schools/medicine/school/about/community/education.html>). Some colleges and universities that do not have medical schools also administer outreach programs.

mentoring, and research internships. Undergraduate outreach programs provide services similar to secondary school programs, as well as academic advising, preparation for the Medical College Admissions Test, and conferences for pre-medical advisors and students regarding the medical school admissions process. Postbaccalaureate programs are another type of outreach program that provides academic enrichment, advising, and test preparation for students from disadvantaged backgrounds to improve their ability to secure admission to medical school. Finally, medical schools often provide special welcoming events, academic support services, and scholarships to students from disadvantaged backgrounds (University of California Office of the President, March 2003). Scholarships are especially important because many students from underrepresented racial/ethnic groups are economically disadvantaged and because California medical schools compete with medical schools in other states for underrepresented students (University of California Office of the President, October 2003).²⁰

Preparing all physicians to provide care to persons from a wide variety of racial/ethnic backgrounds is equally important. Recently, the University of California, Irvine established a new program to increase the number of physicians with the medical, linguistic, and cultural competencies required to serve California's Latino population. The Program in Medical Education for the Latino Community (PRIME-LC) combines a traditional medical school curriculum with additional course work to enhance physicians' ability to meet Latinos' health care needs. The additional course work will include Spanish language instruction, courses on diseases and conditions that have high incidence and prevalence among Latinos, courses on cultural and socio-economic factors that influence Latinos' health, clinical training with monolingual Spanish speaking patients, research projects on health problems facing Latinos, and special electives in Spanish speaking countries. PRIME-LC will enroll its first group of students in fall 2004 and is expected to enroll up to 12 students per year. This program is funded by university resources and a grant from The California Endowment (University of California Office of the President 2004).

²⁰ Under a grant from The California Endowment, California medical schools have awarded 262 scholarships to disadvantaged students since 2001.

The future of many of these important outreach efforts is uncertain. Several major initiatives, such as the scholarship program and PRIME-LC, are funded by The California Endowment. At this point, it is uncertain how long The California Endowment and other private philanthropies will continue to underwrite such initiatives. More stable sources of funding are needed. The California State Legislature should provide UC campuses and other colleges and universities with sufficient resources to maintain and expand outreach programs.

CHAPTER 5: WHAT IS THE IMPACT OF NON-PHYSICIAN CLINICIANS ON DEMAND FOR PHYSICIANS?

The supply of non-physician clinicians, whose scopes of practice increasingly overlap with that of physicians, has increased dramatically in recent years. These non-physician clinicians include certified nurse midwives, certified registered nurse anesthetists, clinical nurse specialists, nurse practitioners (NPs), physician assistants (PAs), optometrists, podiatrists, acupuncturists, chiropractors, naturopathic physicians, psychologists, licensed clinical social workers, and marriage, family, and child counselors (Cooper, Laud, and Dietrich 1998; Scheffler and Kirby 2003). Approximately 36% of persons who received outpatient care in the United States in 1997 obtained care from non-physician clinicians (Druss et al. 2003).

The impact of non-physician clinicians on the demand for physicians depends primarily on the roles that non-physician clinicians play in the delivery of health care services (Druss et al. 2003, Grumbach and Coffman 1998). These roles are functions of state laws governing non-physician clinicians' scopes of practice as well as the preferences of health care organizations and persons seeking health care services. During the 1990s, many states expanded scopes of practice for non-physician clinicians and relaxed requirements for physician supervision (Cooper, Henderson, and Dietrich 1998, Druss et al. 2003). These changes in state licensure laws have made non-physician clinicians more attractive to health care organizations because they can be utilized in a wide variety of settings and to provide a wide range of services.

The roles of non-physician clinicians vary widely across professions and practice settings. In some cases, non-physician clinicians function as substitutes for physicians. Persons may obtain routine eye care from an optometrist instead of an ophthalmologist or receive anesthesia from a certified registered nurse anesthetist instead of an anesthesiologist. In other cases, non-physicians practice in partnership with physicians. For example, approximately 25% of primary care physician practices in the U.S. include NPs and/or PAs as well as physicians (Hooker and McCaig 2001). In still other cases, persons obtain treatment for the same ailment from both physicians and non-physician clinicians. Persons with chronic pain, for example, may seek care from acupuncturists and chiropractors as well as physicians.

The number of non-physician clinicians in the United States has grown rapidly over the past decade. Two of the most rapidly growing professions are NPs and PAs (Cooper, Laud, and Dietrich 1998). These professions were created during the 1960s to improve access to health care services, particularly in rural and inner-city areas (Scheffler 1977, Scheffler et al. 1979). NPs are registered nurses who receive advanced education in direct patient care, typically at the master's level. They are educated in a variety of specialties, the largest of which is family health (Harper and Johnson, 1998). All PAs are educated to provide general medical services, although some also pursue additional specialty training. PAs are educated in certificate, associate degree, bachelor's degree, and master's programs.

All states license NPs and PAs. California law permits NPs and PAs to prescribe medications²¹ and to practice at sites at which physicians are not present, provided physicians are available for consultation by telephone or electronic mail. NPs can also contract directly with health insurance companies. Studies that compare care provided by NPs and PAs to care furnished by physicians to patients with similar health care needs have generally found that NPs and PAs provide the same quality of care as physicians (Mundinger et al. 2000).²² Previous research has shown that NPs and PAs have improved access to primary care in rural and poor areas, as well as in areas with large minority and uninsured populations (Scheffler 1995).

PAs and NPs in the United States

Figure 5.1 illustrates the large upswing in the numbers of PAs and NPs since the early 1990s. The PA population nearly doubled, from roughly 26,660 in 1992 to 45,311 in 2000.²³ Similarly, the NP population increased by nearly 50% between 1996 and 2000. There were roughly 63,500 NPs in 1996 and this number increased to nearly

²¹ California law permitted NPs to prescribe Schedule III-IV medications in 1997 and Schedule II medications in 2004. The regulations are codified in *Business and Professions Code Sections 2836.1 and 2836.2*.

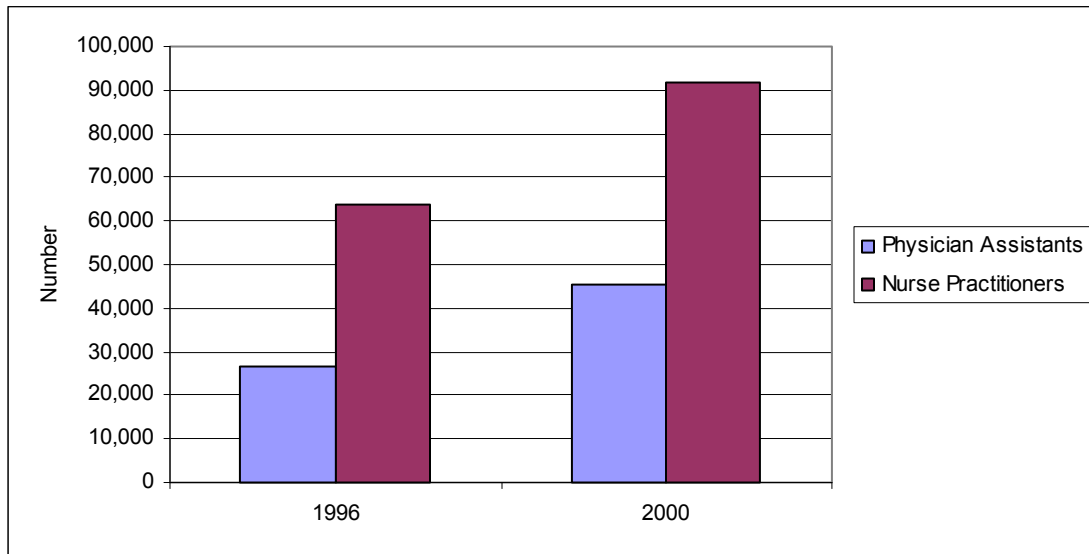
²² These studies examine preventative, diagnostic, and therapeutic services that fall within NPs' and PAs' scopes of practice. Physicians provide some services that NPs and PAs cannot provide, because physicians have a broader scope of practice.

²³ The count of PAs comes from the American Academy of Physician Assistants' Physician Assistant Census Report, 2000. The numbers represent those PAs that were eligible to practice in the United States and not retired, and for whom address information was available.

92,000 in 2000 (reliable data on NPs were unavailable for 1992). These results are consistent with predictions that PAs and NPs would have an increased impact in the health care workforce (Scheffler, Waitzman, and Hillman 1996).

Figure 5.1

PAs and NPs in the United States, 1996 and 2000



Source: Petris Center analysis of the American Academy of Physician Assistants' Physician Assistant Census Reports, 1996 and 2000, and The National Sample Survey of Registered Nurses, 1996 and 2000.

PAs and NPs in California

Table 5.1 presents counts of the number of licensed PAs and NPs in California's counties in 2002, as well as the NP- and PA-to-population ratios. There were 11,233 licensed NPs and 4,670 licensed PAs in the state. Los Angeles County had more than 2,300 NPs and more than 1,250 PAs, whereas the county with the state's smallest population, Alpine, did not have any NPs or PAs.

The distribution of PAs and NPs across counties in the state differs from the distribution of active patient care physicians (see Table 5.1). Unlike physicians, many of the highest NP- and PA-to-population ratios are found in small, rural counties. This finding underscores the importance of these non-physician clinicians in providing care in these areas. With the exception of Marin County, the counties with the highest NP-to-population ratios are small, rural counties such as Sierra, Humboldt, Plumas, and Inyo counties. Similarly, aside from Santa Cruz County, the highest PA to population ratios are found in rural Mariposa, Del Norte, Shasta, and Humboldt counties.

Table 5.1

**Licensed NPs and PAs in California By County, 2002:
Totals and Ratios Per 100,000 Population²⁴**

County	NPs		PAs	
	Total	NP to Population Ratio	Total	PA to Population Ratio
Alameda	608	41	188	13
Alpine	0	0	0	0
Amador	12	33	6	17
Butte	89	43	56	27
Calaveras	14	33	8	19
Colusa	4	21	2	10
Contra Costa	391	40	83	8
Del Norte	6	22	9	32
El Dorado	81	50	27	17
Fresno	402	49	121	15
Glenn	1	4	5	19
Humboldt	93	73	38	30
Imperial	26	17	12	8
Inyo	13	71	2	11
Kern	155	22	95	14
Kings	32	24	27	20
Lake	16	26	7	12
Lassen	11	32	8	23
Los Angeles	2,303	23	1,252	13
Madera	40	31	15	12
Marin	271	109	38	15
Mariposa	7	41	8	47
Mendocino	53	61	18	21
Merced	42	19	31	14
Modoc	2	21	1	11
Mono	5	38	1	8
Monterey	86	21	59	14
Napa	70	55	14	11
Nevada	60	63	21	22
Orange	939	32	374	13
Placer	132	50	64	24
Plumas	15	72	5	24
Riverside	338	21	261	16
Sacramento	410	32	160	12
San Benito	9	16	9	16
San Bernardino	466	26	280	16
San Diego	1,147	39	392	13
San Francisco	483	61	89	11

²⁴ Data for NPs and PAs represent the licensed number of these nonphysician clinicians, regardless of whether they are working and whether they provide patient care. These estimates may slightly overstate the actual NP and PA workforce.

Table 5.1 Continued				
County	NPs		PAs	
	Total	NP to Population Ratio	Total	PA to Population Ratio
San Joaquin	116	19	46	8
San Luis Obispo	133	53	36	14
San Mateo	339	47	75	10
Santa Barbara	96	24	54	13
Santa Clara	429	25	152	9
Santa Cruz	115	45	83	32
Shasta	69	41	54	32
Sierra	3	85	1	28
Siskiyou	26	59	9	20
Solano	140	35	31	8
Sonoma	281	60	38	8
Stanislaus	141	30	76	16
Sutter	21	26	16	20
Tehama	16	28	6	11
Trinity	5	38	2	15
Tulare	80	21	59	16
Tuolumne	33	59	11	20
Ventura	271	35	89	11
Yolo	75	43	42	24
Yuba	12	19	4	6
California Total	11,233		4,670	

Source: Petris Center analysis of data from the State of California, Department of Consumer Affairs.
Population data from the California Department of Finance.

The importance of PAs and NPs is highlighted in Table 5.2. The table first provides the active, patient care physician-to-population ratios in California's counties in 2002. It then compares those ratios with a broader patient care workforce-to-population ratio, encompassing active, patient care physicians, NPs, and PAs. Consistent with previous studies that estimated the productivity of NPs and PAs to be between .50 and .75 of the productivity of physicians (Scheffler, Waitzman, and Hillman 1996), we counted NPs and PAs as representing two-thirds of a physician. The data confirm that non-physician clinicians are playing an important role across California. NPs and PAs appear to be particularly important in providing care in small, rural counties. The largest impact of NPs and PAs occurred in Plumas county, where the broader ratio increased by 125%. In Calaveras, Glenn, Lassen, and Mariposa counties the ratios increased by more than 40%.

Table 5.2**Adding NPs and PAs to Provider-to-Population Ratios
in California by County, 2002²⁵**

County	Active Patient Care Physician to Population Ratio	Active Patient Care Physician, NP, and PA to Population Ratio ^a	Percent Change
Alameda	220	256	16%
Alpine	0	0	0%
Amador	164	197	20%
Butte	191	237	24%
Calaveras	77	112	46%
Colusa	62	83	33%
Contra Costa	212	244	15%
Del Norte	173	209	21%
El Dorado	158	202	28%
Fresno	164	206	26%
Glenn	34	49	44%
Humboldt	219	288	31%
Imperial	71	88	24%
Inyo	203	258	27%
Kern	123	148	20%
Kings	84	113	35%
Lake	121	146	21%
Lassen	79	116	47%
Los Angeles	205	229	12%
Madera	90	118	31%
Marin	466	548	18%
Mariposa	47	105	125%
Mendocino	205	260	26%
Merced	94	116	24%
Modoc	64	86	33%
Mono	181	211	17%
Monterey	165	188	14%
Napa	303	347	14%
Nevada	224	281	25%
Orange	234	264	13%
Placer	244	293	20%
Plumas	143	207	44%
Riverside	117	141	21%
Sacramento	196	225	15%
San Benito	74	95	29%
San Bernardino	135	163	21%
San Diego	232	267	15%
San Francisco	450	498	11%

²⁵ Data for NPs and PAs represent the licensed number of these nonphysician clinicians, regardless of whether they provide patient care. These estimates may slightly overstate the actual NP and PA workforce.

Table 5.2 (continued)

County	Active Patient Care Physician to Population Ratio	Active Patient Care Physician, NP, and PA to Population Ratio ^a	Percent Change
San Joaquin	129	147	14%
San Luis Obispo	244	288	18%
San Mateo	268	307	14%
Santa Barbara	233	258	11%
Santa Clara	245	268	9%
Santa Cruz	231	282	22%
Shasta	245	293	20%
Sierra	0	76	N/A
Siskiyou	149	201	35%
Solano	159	187	18%
Sonoma	228	274	20%
Stanislaus	145	176	21%
Sutter	206	236	15%
Tehama	98	124	26%
Trinity	92	128	39%
Tulare	110	135	22%
Tuolumne	177	230	30%
Ventura	180	211	17%
Yolo	260	305	17%
Yuba	121	139	14%
California Total	204	234	15%

Note: Analysis does not account for specialties of physicians, NPs, or PAs.

^aPAs and NPs counted as two-thirds of a doctor.

Source: Petris Center analysis of AMA Physician Masterfile and data from the State of California, Department of Consumer Affairs. Population data from the California Department of Finance.

PA and NP Income

Consistent with their increasing role and importance in the provision of health care in the United States over the past 15 years, PAs and NPs have experienced a significant increase in their earnings. The 2003 National Salary Survey of Nurse Practitioners (<http://www.advancefornp.com/common/editorial/editorial.aspx?CC=27756>) reports that mean NP incomes nationally increased from \$52,532 in 1997 to \$69,203 in 2003.²⁶ California NPs earned \$76,710 on average in 2003. Incomes of PAs have also been increasing. Data from the American Academy of Physician Assistants' Physician Assistant Census Report indicate that mean PA incomes nationally increased

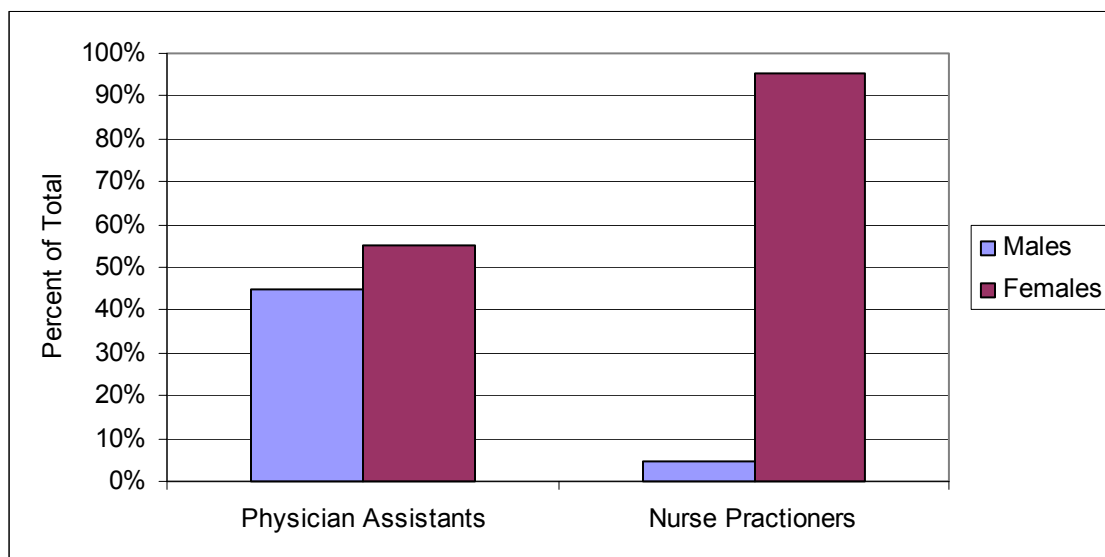
²⁶ Data from the 2003 NP National Salary Survey of Nurse Practitioners is taken from a self-selected sample of readers of *Advance for Nurse Practitioners*. The survey captured information on 3,731 NPs nationally, but may not be statistically representative of the NP population in California.

from \$72,241 in 2002 to \$76,039 in 2003.²⁷ The data also indicate that California's PAs earned \$84,177 on average in 2003.

PAs and NPs by Gender

In 2000, the PA population was fairly equally distributed between men and women. Figure 5.2 highlights the gender distribution of PAs and NPs. Forty-five percent of U.S. PAs were men and 55% were women. The U.S. NP population, however, was overwhelmingly comprised of women. Ninety-five percent of NPs were women in 2000. This finding is not surprising, because women represent a disproportionately high percentage of the overall nursing population. In contrast, 23% of U.S. physicians were female and 77% were male in 2000. The gender compositions of the California NP, PA, and physician populations were similar to those observed nationwide (OSHPD 2000).

Figure 5.2
Proportion of U.S. PAs and NPs by Gender, 2000



Source: Petris Center analysis of the American Academy of Physician Assistants' Physician Assistant Census Report, 2000, and The National Sample Survey of Registered Nurses, 2000.

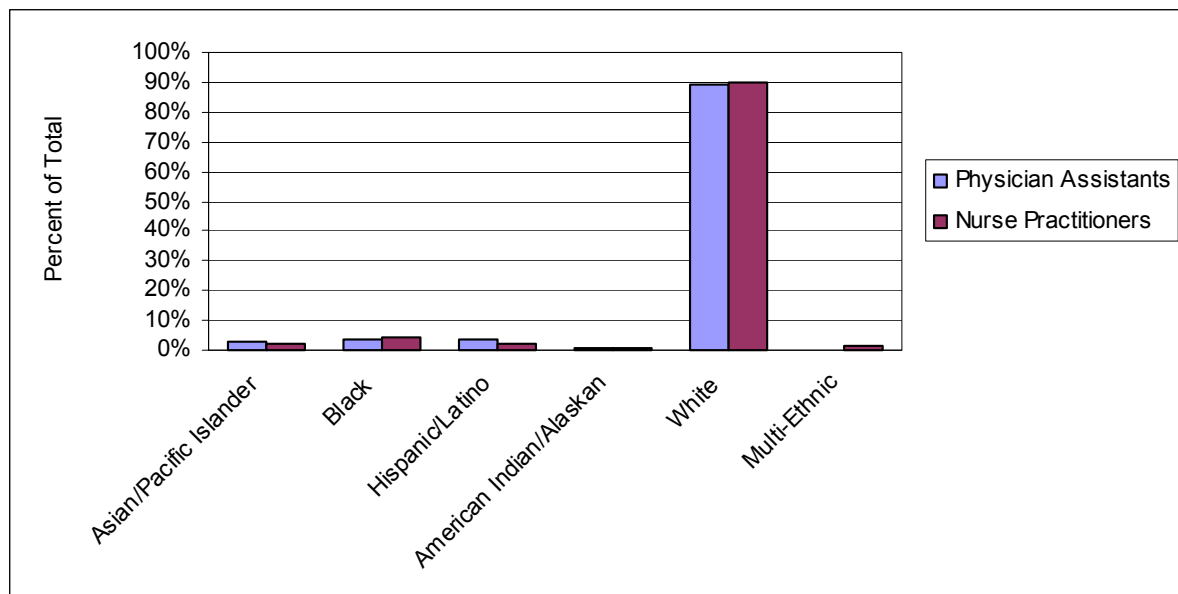
²⁷ The AAPA survey included data on 20,878 PAs nationally. The sample represents 36.1 percent of all eligible PAs nationally and 37.5 percent of the PAs who were mailed a survey form.

Race and Ethnicity of PAs and NPs

Nationwide PAs and NPs are predominantly white.²⁸ Figure 5.3 presents the race/ethnicity of PAs and NPs in 2000. Among U.S. PAs and NPs, neither Asian/Pacific Islanders, Black,²⁹ Hispanic/Latino, American Indian/Native Alaskan, nor multi-ethnic groups made up more than 5% of the total providers in 2000. California's PAs and NPs are somewhat more racially/ethnically diverse. Asian-Pacific Islanders constituted 7% of the state's PAs and NPs in 1998. Six percent of NPs and 13% of PAs were Hispanic (OSHPD 2000).

Figure 5.3

Proportion of U.S. PAs and NPs by Race/Ethnicity, 2000



Source: Petris Center analysis of the American Academy of Physician Assistants' Physician Assistant Census Report, 2000, and The National Sample Survey of Registered Nurses, 2000.

Work Settings of PAs and NPs

PAs and NPs work in a variety of settings. Table 5.2 shows the types of primary employers of non-physician clinicians in 2000. Among PAs, 11.3% worked in solo physician offices, 39.5% were employed by group practices, 25.4% worked in hospitals, and 6.7% worked in community health centers. NPs were most likely to work in hospital

²⁸ PAs and NPs described as "white" are technically white, non-Hispanic.

²⁹ PAs and NPs described as "Black" are technically Black, non-Hispanic.

inpatient and outpatient departments (34.0%). Additionally, 14.4% were employed in public/community health settings, and 28.5% worked in ambulatory care settings.

Table 5.3

Primary Employer of U.S. PAs and NPs, 2000

Primary Employer	Number
PAs	
Self-Employed	1.5%
Solo Physician Office	11.3%
Single-Specialty Physician Group	26.1%
Multi-Specialty Physician Group	13.4%
University Hospital	7.7%
Hospital (non-university)	17.7%
Freestanding Urgent Care	1.5%
Freestanding Surgical Center	0.1%
Nursing Home/Long-Term Care	0.3%
Home Health Agency	0.0%
Health Maintenance Organization (HMO)	3.9%
Community Health Center	6.7%
Medical Staffing Agency	0.2%
Physician Practice Management Organization	1.9%
Integrated Health System	1.5%
Corrections Systems	1.7%
Other	4.3%
NPs	
Hospital (inpatient and outpatient)	34.0%
Nursing Home Care	2.6%
Nursing Education	6.9%
Public Health/Community Health	14.4%
Student Health	8.2%
Occupational Health	2.0%
Owned/Not Owned Ambulatory Care	28.5%
Insurance Claims/Benefits	1.6%
Plan Licensing Agency	0.2%
Other	1.3%
Unknown/Refused	0.2%

Source: Petris Center analysis of the American Academy of Physician Assistants' Physician Assistant Census Report, 2000 and The National Sample Survey of Registered Nurses, 2000.

Specialty of PAs and NPs

PAs and NPs also worked for employers in a variety of specialties in 2000. Nationwide, approximately 48% of PAs were employed by family or generalist physicians. Other popular specialties for PAs include surgical specialties (17.4%) and emergency room care (9.7%). A higher percentage of California PAs practice in

generalist settings than in the U.S. overall (55% versus 48%). Forty-nine percent of California NPs practiced in generalist settings in 1998 (OSHDP 2000).

Table 5.4

Primary Specialty Practiced by U.S. PAs, 2000	
General Specialty Practiced	Percentage
Family/General Medicine	36.5%
General Internal Medicine	8.8%
Emergency Medicine	9.7%
General Pediatrics	2.6%
General Surgery	2.7%
Internal Medicine Specialties	8.1%
Pediatric Specialties	1.5%
Surgical Specialties	17.4%
Obstetrics-Gynecology	2.7%
Industrial/Occupational Medicine	3.5%
Other	6.5%

Source: Petris Center analysis of the American Academy of Physician Assistants' Physician Assistant Census Report, 2000.

Conclusions and Policy Recommendations

PAs and NPs represent a significant and growing segment of California's health care workforce. They provide care in a number of specialties and settings. Arguably their most important contribution is to primary care, particularly in the state's counties that lack adequate supplies of active patient care physicians, as seen in Table 5.2.

Policymakers should take an active role in capitalizing on the skills and abilities of PAs and NPs. Several possible policy alternatives exist. For example, measures could be established to encourage more students to become PAs or NPs. Policymakers may also wish to use methods to deploy these non-physician clinicians in a manner that capitalizes on their ability to complement and supplement physicians. For example, policymakers could increase funding for programs that repay student loans of NPs and PAs who practice in medically underserved areas. Policymakers can also increase funding for PA and NP programs that recruit students from underserved areas and prepare them for the unique challenges of practice in those areas. Examples of these programs are discussed in Chapter 3. Finally, there may also be opportunities to prepare additional NPs and PAs to practice collaboratively with specialists in specialties in which physicians may be in short supply.

Finally, as seen in Figure 5.4, the overwhelming number of PAs and NPs are white, non-Hispanic. Any policies directed towards the supply of PAs or NPs should strive to increase racial/ethnic diversity. The options for improving racial/ethnic concordance between physicians and patients discussed in Chapter 4 should be considered for non-physician clinicians, as well.

CHAPTER 6: WHERE DO WE GO FROM HERE?

The findings from the preceding five chapters of this report suggest that California policymakers should take several actions to ensure that all Californians have access to medical care.

Overall Supply of Physicians

Findings

Analysts use three primary methods for assessing the adequacy of physician supply in a geographic area: relative benchmarking, normative benchmarking, and economic analysis of the labor market. Relative benchmarks indicate whether the supply of physicians in the geographic area of interest differs from that of other geographic areas. Normative benchmarks provide uniform standards by which the adequacy of physician supply in a geographic area can be assessed. Economic analysis of the labor market examines trends in physician income to assess the signals physicians are receiving regarding the demand for their services.³⁰

From a needs-based perspective, our results indicate that the overall number of doctors in the state is adequate at present. The number of physicians in California has nearly doubled over the past 25 years and the ratio of physicians to population has grown by 25%. The ratio of physicians to population in California is similar to that of the U.S. overall and exceeds requirements established by the Council on Graduate Medical Education.

California could face a physician shortage in the future as older physicians retire. Approximately 32% of California's active patient care physicians are aged 56 or older. Many of these physicians are likely to retire over the next 10 years. The number of young, active patient care physicians in the state has not grown sufficiently to keep pace with impending retirements.

California's ability to avert a physician shortage will depend largely on the functioning of the physician labor market. Average physician income in California declined from 1995 to 1999, suggesting that there was a slight oversupply of physicians.

³⁰ Chapter 1 contains a more extensive discussion of methods used to evaluate physician supply.

This decrease in income may have contributed to the decrease in the number of young physicians during this time period. A large wave of retirements is likely to change the signals that the market sends to young physicians. Retirements may create a shortage of physicians, which may lead health plans to increase payments to physicians. An increase in compensation probably would lead greater numbers of young physicians to relocate to California or remain in the state following residency.

Policy Recommendations

The best available evidence suggests that no action needs to be taken to significantly increase the overall number of physicians in California. However, policymakers should support alternatives to traditional doctor-patient visits that can improve the efficiency and effectiveness of medical care. For example, policymakers can promote the use of electronic mail, the Internet, telemedicine, and other information technologies. Other examples include increasing the utilization of nurse practitioners (NPs), physician assistants (PAs), and other non-physician clinicians. The presence of these alternatives allows the health services market to adjust more quickly in response to changes in the supply and demand for physicians. Policymakers should also address disparities in the geographic distribution and racial/ethnic diversity of physicians that the physician labor market will not adequately resolve. Recommendations in these areas are discussed below.

Research Recommendations

As part of an early-warning system on trends in the physician workforce, California needs to invest in the collection of data on physician workforce trends. Without this important information, targeted policy efforts cannot be effectively designed. The Medical Board of California has taken an important first step in this process with a bi-annual physician survey, begun in 2003. State officials should provide the California Medical Board with sufficient resources to complete periodic surveys of California's licensed physicians. These surveys should assess demographic information as well as indicators of supply and demand for physicians, such as the number of hours that physicians work and their incomes. Policymakers should also fund studies of the impact of trends in population demographics, the burden of disease, advances in

biomedical science, and the financing and organization of health care services on demand for physicians.

Specialty Distribution

Findings

Although the overall ratio of physicians to population in California has increased greatly since the late 1970s, trends vary significantly across physician specialties. From a needs-based perspective, the statewide ratio of generalist physicians to population increased during the 1990s and appears adequate to meet the state's overall needs. Ratios of hospital-based and medical specialists to population have increased dramatically, while ratios of obstetrician/gynecologists and psychiatrists have remained stable. In contrast, the ratio of surgical specialists to population has decreased. However, from a market perspective, trends in physicians' incomes during the mid-to-late 1990s suggest that California may be experiencing mild shortages of medical specialists, surgical specialists, and psychiatrists.

Policy Recommendations

No action needs to be taken to increase the number of specialists in California. The increases in incomes earned by medical specialists, surgical specialists, and psychiatrists should attract additional physicians to these specialties. Moreover, the increases were modest, which suggests that shortages in these specialties were not severe.

Research Recommendations

The California Medical Board survey and other efforts to collect information about California's physician workforce should encompass information on physicians by major specialty so that policymakers can determine whether shortages exist in certain specialties. Studies of factors that affect demand for physicians should address whether demand is changing in certain specialties. Such information would help policymakers determine whether they should intervene to address shortages.

Geographic Distribution

Findings

From a needs-based perspective, California's physicians are not adequately distributed across the state. Some counties have ample numbers of physicians, whereas others have severe shortfalls. Non-metropolitan counties and counties with low per capita incomes have the least adequate supplies of physicians. Counties with high percentages of Hispanic residents have insufficient numbers of generalist physicians.

Unfortunately, physician labor markets do not respond to shortfalls in the number of physicians needed by the population, but only to changes in the economic demand for physicians. In some areas of California, demand for physicians is constrained because much of the population is uninsured or dependent on public health care programs. As a consequence, policy interventions are often necessary to improve the geographic distribution of physicians.

Policy Recommendations

To correct the maldistribution of physicians in the state, focused interventions would be the most effective. These interventions can be aimed at either the supply side or the demand side of the physician labor market (or both).

One major supply-side approach we suggest is to modestly increase medical school and residency enrollment through programs targeted at preparing physicians to meet the needs of underserved populations and communities. Policymakers should also support targeted initiatives to increase the number of medical students from underserved rural and urban areas, because such individuals are more likely to practice in underserved areas. In addition, policymakers should maintain existing programs that support training for medical students and medical residents in underserved areas, such as the Area Health Education Centers, the Shortage Area Medical Education and Training Program, and the Song-Brown Family Physician Training Program. Finally, policymakers should continue to support scholarship and loan repayment programs administered by the California Medical Board and the Office of Statewide Health Planning and Development, because these programs provide financial incentives for physicians to practice in underserved areas.

California lawmakers may also wish to expand alternative means for providing medical care to persons who live in underserved areas. For example, policymakers could increase funding for training grants and scholarship and loan repayment programs for NPs and PAs who practice in underserved areas. Other examples include increased investment in telemedicine services and other information technologies that reduce the need for persons in rural areas to travel long distances to obtain care.

Policymakers could also adopt demand-side measures, such as the expansion of health insurance. Increasing the number of persons in underserved areas who have health insurance would increase demand for medical care in these areas, which would enhance these areas' ability to attract physicians. Options include tax deductions for purchase of health insurance, employer mandates, such as SB 2, and expansion of public health insurance programs, such as Medi-Cal and Healthy Families.

Race/Ethnicity

Findings

We also find that physicians in the state do not mirror the racial/ethnic diversity of the state's population. The disparity is particularly evident among Hispanics and Blacks, who are significantly underrepresented among physicians. Although California's physicians are becoming more racially/ethnically diverse over time, Blacks, Hispanic, and Native Americans remain underrepresented among California's physicians. Improving racial/ethnic concordance between California physicians and its population will require dramatic increases in the number of doctors from underrepresented racial/ethnic groups.

Policy Recommendations

Policymakers should increase funding for outreach programs at the K-12 and undergraduate levels that aim to increase the number of underrepresented minority Californians eligible for medical school. Educational outreach programs include campus tours, curriculum enhancement, academic enrichment, mentoring, research internships, test preparation, and dissemination of information about careers in medicine and medical school admissions requirements. Increased investment at the undergraduate level is

particularly critical to making progress in the short run because many potential medical students fail to complete medical school prerequisites as undergraduates. Post-baccalaureate programs are another effective short-run strategy because they provide academic enrichment and advice to college graduates who are motivated to become physicians. Policymakers should also provide a stable source of long-term funding for scholarships for disadvantaged students admitted to California's medical schools.

Policymakers should also provide stable, ongoing funding for initiatives that seek to increase the number of physicians who have the linguistic and cultural competencies needed to provide high quality care to California's racially/ethnically diverse population. Examples include the University of California's new Program in Medical Education for the Latino Community (PRIME-LC), which will provide supplemental education in Spanish and on the cultural and socioeconomic factors that affect Latino health, as well as clinical training at sites that serve monolingual Spanish-speaking patients. Other examples include scholarship programs for medical students who are committed to providing care to underserved populations and have pertinent linguistic and cultural competencies.

Nurse Practitioners and Physician Assistants

Findings

Finally, PAs and NPs represent a significant and growing segment of the California health care workforce. They provide important care in a number of specialties and settings. Arguably their most important contribution is primary care, particularly in areas of California that lack adequate supplies of active patient care physicians. NPs and PAs also practice in partnership with physicians and may be able to ease physician shortages by providing routine care, thereby freeing physicians to focus on patients with more complex needs.

Policy Recommendations

California's policymakers should continue to make a concerted effort to capitalize on the skills and abilities of PAs, NPs, and other non-physician clinicians. Policymakers should increase funding for training programs that prepare NPs and PAs for practice in

underserved areas. They should also expand scholarship and loan repayment programs that provide financial assistance to NPs and PAs in exchange for practice in underserved areas.

WORKS CITED

- American Chamber of Commerce Research Association (2002). *ACCRA Cost of Living Index*. Louisville, KY: Author.
- American Medical Group Association (2002). *Annual Compensation & Productivity Survey*. Alexandria, VA: Author.
- Aventis (2002). *Managed Care Digest Series 2002*. Author.
- Benham L, Maurizi A, and Reder MW (1968). "Migration, Location and Remuneration of Medical Personnel: Physicians and Dentists." *Review of Economics and Statistics* 50(3): 332-347.
- Blumenthal D (2004). "New Steam from an Old Cauldron: The Physician-Supply Debate." *New England Journal of Medicine* 350(17): 1780-1787.
- Brown ER and Lavarreda SA (2003). "Over Half of California's 6.3 Million Uninsured Lack Health Coverage for More Than a Year." Los Angeles: UCLA Center for Health Policy Research.
- Brown T, Scheffler R, Tom S, and Schulman K (2004). *The Economic Value of a Diverse Physician Workforce*. Working Paper, Nicholas C. Petrakis Center on Health Care Markets and Consumer Welfare, University of California at Berkeley; Center for Clinical and Genetic Economics, Duke University.
- California Legislative Analyst's Office (2002). *HMOs and Rural California*. Sacramento, CA: Author.
- California Medical Association (2001). *And Then There Were None: The Coming Physician Supply Problem*. San Francisco, CA: Author.
- California Senate Office of Research (2003). *Stretched Thin: Growing Gaps in California's Emergency Room Backup System*. Sacramento, CA: Author.
- Cantor JC, Miles EL, Baker LC, and Barker DC (1996). "Physician Service to the Underserved: Implications for Affirmative Action in Medical Education." *Inquiry*. 33(2): 167-180.
- Cattaneo and Stroud (2003). "2003 Statewide HMO and Special Programs Enrollment Study." Burlingame, CA: Cattaneo & Stroud, Inc.
http://www.cattaneostroud.com/2003HMO_Study.
- Coffman JM, Young JQ, Vranizank K, Blick N, and Grumbach K (1996). *California Needs Better Medicine*. San Francisco: UCSF Center for the Health Professions.

- Coffman J, Levin R, Colburn L, and Grumbach K (2001). *Holding onto Our Own: Migration Patterns of Underrepresented Minority Californians in Medicine*. Berkeley, CA: California Program on Access to Care, California Policy Research Center.
- Coffman JM, Rosenhoff, and Grumbach K (2002). *Improving Recruitment and Retention of Primary Care Practitioners in Rural California*. Berkeley, CA: California Program on Access to Care.
- Colburn L, Zhang K, Ficklen E, and Terrell C (2002). *Minority Students in Medical Education Facts and Figures XII*. Washington, DC: Association of American Medical Colleges.
- Connor RA, Hillson SD, and Krawelski JE (1995). "Competition, Professional Synergism, and the Geographic Distribution of Rural Physicians." *Medical Care* 33(11):1067-1078.
- Cooper JK, Heald K, Samuels M, and Coleman S (1975). "Rural or Urban Practice: Factors Influencing the Location Decision of Primary Care Physicians." *Inquiry* 12: 18-25.
- Cooper RA. (2002). "There's a Shortage of Specialists. Is Anyone Listening?" *Academic Medicine* 77(8): 761-766.
- Cooper RA, Getzen TE, McKee HJ, and Laud P. (2002). "Economic and Demographic Trends Signal an Impending Physician Shortage." *Health Affairs* 21(1): 140-154.
- Cooper RA, Henderson T, and Dietrich CL (1998). "Roles of Non-physician Clinicians as Autonomous Providers of Patient Care." *Journal of the American Medical Association* 280(9): 795-802.
- Cooper RA, Laud P, and Dietrich CL (1998). "Current and Projected Workforce of Nonphysician Clinicians." *Journal of the American Medical Association* 280(9): 788-794.
- Cooper-Patrick L, Gallo JJ, Gonzales JJ, Vu HT, Powe NR, Nelson C, and Ford DE (1999). "Race, Gender, and Partnership in the Patient-Physician Relationship." *Journal of the American Medical Association* 282(6): 583-589.
- Costa D (1998). *The Evolution of Retirement: An American Economic History, 1880-1990*. Chicago: University of Chicago Press.
- Council on Graduate Medical Education (1996). *Eighth Report: Testing Physician Supply Requirements*. Washington, DC: Government Printing Office.

- Council on Graduate Medical Education (1998). *Tenth Report: Physician Distribution and Health Care Challenges in Rural and Inner-City Areas*. Washington, DC: Government Printing Office.
- Dower C, McRee TA, Grumbach K, et al. (2001). *The Practice of Medicine in California: A Profile of the Physician Workforce*. San Francisco, CA: UCSF Center for the Health Professions.
- Draper DA, Hurley RE, Lesser CS, Strunk BC (2002). "The Changing Face of Managed Care." *Health Affairs* 21(1): 11-23.
- Druss BG, Marcus SC, Olfson M, Tanielian T, and Pincus HA (2003). "Trends in Care by Non-physician Clinicians in the United States." *New England Journal of Medicine* 348(2): 130-137.
- Escarce JJ, Polsky D, Wozniak GD, and Kletke PR (2000). "HMO Growth and the Geographic Redistribution of Generalist and Specialist Physicians, 1987-1997." *Health Services Research* 35(4): 825-848.
- Feldman R (1979). "A Model of Physician Location and Pricing Behavior." In *Research in Health Economics*, RM Scheffler, ed. Greenwich, CT: JAI Press. Volume 1, pgs. 185-216.
- Forte GJ, McGinnis S, Beaulieu M, Hernandez B, and Salsberg E (2004). *California Physician Workforce: Supply and Demand through 2015*. Albany, NY: Author.
- Fryer GE, Green LA, Vojir CP, Krugman RD, Miyoshi TJ, Stine C, and Miller ME (2001). "Hispanic versus White, non-Hispanic Physician Medical Practices in Colorado." *Journal of Health Care for the Poor and Underserved* 12(3): 342-351.
- Gabel JR, Claxton G, Holve E, and Pickreign J (2003). "Health Benefits in 2003: Premiums Reach Thirteen-year High as Employers Adopt New Forms of Cost Sharing." *Health Affairs* 22(5): 117-125.
- Gabel JR, Whitmore H, Rice T, and Lo Sasso AT (2004). "Employers' Contradictory Views about Consumer-Driven Health Care: Results From a National Survey." *Health Affairs*. Web Exclusive. April. Pgs. 210-218.
- Gray B and Stoddard JJ (1997). "Patient-Physician Pairing: Does Racial and Ethnic Congruity Influence the Selection of a Regular Physician?" *Journal of Community Health* 22(4): 247-259.
- Grumbach K, Mertz E, and Coffman JM (1999). *Underrepresented Minorities and Medical Education in California*. San Francisco, CA: UCSF Center for the Health Professions.

- Grumbach K, Coffman J, Liu R, and Mertz E (1999). *Strategies for Increasing Physician Supply in Medically Underserved Communities in California*. Berkeley, CA: California Policy Research Center.
- Grumbach K, Coffman JM, Young JQ, Vranizan K, and Blick N (1998). "Physician Supply and Medical Education in California. A Comparison with National Trends." *Western Journal of Medicine* 168(5):412-21.
- Grumbach K and Coffman J (1998). "Physicians and Non-physician Clinicians: Complements or Competitors?" *Journal of the American Medical Association* 280(9): 825-826.
- Guadagnoli E and Ward P (1998). "Patient Participation in Decision-Making." *Social Science and Medicine* 47(3): 329-39.
- Harper DC and Johnson J (1998). "The New Generation of Nurse Practitioners: Is More Enough?" *Health Affairs* 17(5): 158-164.
- Hooker RS and McCaig LF (2001). "Use of Physician Assistants and Nurse Practitioners in Primary Care, 1995-1999." *Health Affairs* 20(4): 231-238.
- Hsu J, Reed M, Brand R, Fireman B, Newhouse JP and Selby JV (2004). "Cost-Sharing: Patient Knowledge and Effects on Seeking Emergency Department Care." *Medical Care* 42(3): 290-296.
- Jacob JA (2002). "Specialties See Higher Pay, Primary Care Not So Much." *American Medical News*, August 5: 45, 29.
- Jiang HJ and Begun JW (2002). "Dynamics of Change in Local Physician Supply: An Ecological Perspective." *Social Science & Medicine* 54(10): 1525-1541.
- Journal of the American Medical Association (1992). "Graduate Medical Education." *Journal of the American Medical Association* 268(9): 1170-1171.
- Journal of the American Medical Association (1993). "Graduate Medical Education." *Journal of the American Medical Association*. 270(9): 1116-1117.
- Journal of the American Medical Association (1994). "Graduate Medical Education." *Journal of the American Medical Association* 272(9): 725-726.
- Journal of the American Medical Association (1995). "Graduate Medical Education." *Journal of the American Medical Association* 274(9): 755-756.

- Journal of the American Medical Association (1996). "Graduate Medical Education." *Journal of the American Medical Association* 276(9): 739-740.
- Journal of the American Medical Association (1997). "Graduate Medical Education." *Journal of the American Medical Association* 278(9): 775-776.
- Journal of the American Medical Association (1998). "Graduate Medical Education." *Journal of the American Medical Association* 280(9): 836-837.
- Journal of the American Medical Association (1999). "Graduate Medical Education." *Journal of the American Medical Association* 282(9): 893-895.
- Journal of the American Medical Association (2000). "Graduate Medical Education." *Journal of the American Medical Association* 284(9): 1159-1161.
- Journal of the American Medical Association (2001). "Graduate Medical Education." *Journal of the American Medical Association* 286(9): 1095-1097.
- Journal of the American Medical Association (2002). "Graduate Medical Education." *Journal of the American Medical Association* 288(9): 1151-1153.
- Journal of the American Medical Association (2003). "Graduate Medical Education." *Journal of the American Medical Association* 290(9): 1234-1236.
- Keith SN, Bell RM, Swanson AG, and Williams AP (1985). "Effects of Affirmative Action in Medical Schools. A Study of the Class of 1975." *New England Journal of Medicine* 313(24): 1519-1525.
- Kingston R, Tisnado D, and Carlisle D (2001). "Increasing Racial and Ethnic Diversity among Physicians: An Intervention to Address Health Disparities?" In *The Right Thing to Do: The Smart Thing to Do: Enhancing Diversity in the Health Professions*. BD Smedley et al, eds. Washington, DC: National Academy Press.
- Komaromy M., et al. (1996). "The Role of Black and Hispanic Physicians in Providing Health Care for Underserved Populations." *New England Journal of Medicine* 334(20): 1305-1310.
- Langwell KM, Drabek J, Nelson SL, and Lenk E (1987). "Effects of Community Characteristics on Young Physicians' Decisions Regarding Rural Practice." *Public Health Reports* 102(3): 317-328.
- LaVeist, Thomas A. et al. 2003. "The association of doctor-patient race concordance with health services utilization." *Journal of Public Health Policy* 24(3-4): 312-323.

- Laveist TA and Nuru-Jeter A (2002). "Is Doctor-Patient Race Concordance Associated with Greater Satisfaction with Care?" *Journal of Health and Social Behavior* 43(3): 296-306.
- Lauer TM, Goebel AM, Wokenbrod L, et al. (2002). *The InterStudy Competitive Edge 12.2: Part II: HMO Industry Report*. Minneapolis: InterStudy.
- Leonardson G, Lapierre R, and Hollingsworth D (1985). "Factors Predictive of Physician Location." *Journal of Medical Education* 60: 37-43.
- Mittler J and Gold M (2003). *Building and Sustaining Physician Networks in Medi-Cal Managed Care and Healthy Families*. Oakland, CA: Medi-Cal Policy Institute, California HealthCare Foundation.
- Morrisey MA, Kletke PR, and Marder WD (1991). "The Role of Local Hospitals in Physician Rural Location Decisions." *Inquiry* 28: 7-18.
- Moy E, Bartman BA, and Weir MR (1995). "Access to Hypertensive Care: Effects of Income, Insurance, and Source of Care." *Archives of Internal Medicine* 155(4): 1497-1502.
- Mundinger MO, Kane RL, Lenz ER, Totten AM, Tsai WY, Cleary PD, Friedewald WT, Siu AL, and Shelanski ML (2000). "Primary Care Outcomes in Patients Treated by Nurse Practitioners or Physicians: A Randomized Trial." *Journal of the American Medical Association* 283(1): 59-68.
- Newhouse JP, Williams AP, Bennett BW, and Schwartz WB (1982). "Does the Geographical Distribution of Physicians Reflect Market Failure?" *The Bell Journal of Economics* 13(2): 493-505.
- Norbut M (2003). "Physician Compensation Surveys not Encouraging." *American Medical News*, September 15: 46, 35.
- O'Neil E (2003). "Centering on...Physician Shortage?" San Francisco, CA: UCSF Center for the Health Professions. http://www.futurehealth.ucsf.edu/from_the_director.html
- OSHPD and UCSF CCHWS (2000). *Nurse Practitioners, Physician Assistants and Certified Nurse Midwives in California*. Sacramento, CA: Author.
- Pathman DE, Knorad TR, and Schwartz R (2002). "The Proximity of Predominantly African-American and Hispanic Rural Communities to Physicians and Hospital Services." *Journal of Rural Health* 18(3): 416-427.
- Pope GC and Schneider JE (1992). "Trends in Physician Income." *Health Affairs* 11(1): 181-193.

- Rabinowitz HK, Diamond JJ, Veloski JJ, and Gayle JA (2000). "The Impact of Multiple Predictors on Generalist Physicians' Care of Underserved Populations." *American Journal of Public Health* 90(8): 1125-1128.
- Saha S, Komaromy M, Koepsell TD, and Bindman AB (1999). "Patient-Physician Racial Concordance and the Perceived Quality and Use of Health Care." *Archives of Internal Medicine* 159(9): 997-1004.
- Schauffler HS and Brown ER (1999). *The 1999 Health Insurance Policy Program Report*. Berkeley, CA: University of California, Berkeley, Center for Health and Public Policy Studies.
- Schauffler HS, McMenamin S, and Zawacki H (2001). *Health Care Trends and Indicators in California and the United States*. Menlo Park, CA: Kaiser Family Foundation.
- Scheffler RM (1977). "The Employment, Utilization, and Earnings of Physician Extenders." *Social Science and Medicine* 11 (17-18): 785-791.
- Scheffler RM and Kirby PB (2003). "The Occupational Transformation of the Mental Health System." *Health Affairs* 22(5): 177-188.
- Scheffler RM, Yoder SG, Weisfeld N, and Ruby G (1979). "Physicians and New Health Practitioners: Issues for the 1980s." *Inquiry* 16(3): 195-229.
- Scheffler RM (1995). "Report on Selected Non-physician Practitioners in Primary Care: Physician Assistants, Nurse Practitioners and Certified Nurse Midwives." Berkeley, CA: Author.
- Scheffler RM, Waitzman NJ, and Hillman JM (1996). "The Productivity of Physician Assistants and Nurse Practitioners and Health Work Force Policy in the Era of Managed Health Care." *Journal of Allied Health* 25(3): 207-217.
- Seifer S, Vranizan K, and Grumbach K (1995). "Graduate Medical Education and Physician Practice Location." *Journal of the American Medical Association* 274(9): 685-691.
- Singer A (2003). *2002 Annual Report on Osteopathic Medical Education*. Chevy Chase, MD: American Association of Colleges of Osteopathic Medicine.
- Simon CJ and Born PH (1996). "Physician Earnings in a Changing Managed Care Environment." *Health Affairs* 15(3): 124-133.

- Trude S, Christianson JB, Lesser CS, Watts C, and Benoit AM (2002). "Employer-sponsored Health Insurance: Pressing Problems, Incremental Changes." *Health Affairs* 21(1): 66-75.
- University of California Office of the President (October 2003). *Fifth Interim Report to the California Endowment: An Update on California's Medical Student and Workforce Initiative*. Oakland, CA: Author.
- University of California Office of the President (2004). *Proposal to The California Endowment for Program in Medical Education for the Latino Community*. Oakland, CA: Author.
- University of California Office of the President (March 2003). *University of California Health Professions and Outreach*. Oakland, CA: Author.
- United States General Accounting Office (2003). *Physician Workforce: Physician Supply Increased in Metropolitan and Nonmetropolitan Areas But Geographic Disparities Persisted*. Washington, DC: U.S. General Accounting Office (Report No. GAO-04-124).
- Wong MD, Andersen R, Sherbourne CD, Hays RD and Shapiro MF (2001). "Effects of Cost Sharing on Care Seeking and Health Status: Results from the Medical Outcomes Study." *American Journal of Public Health* 91(11): 1889-1894.

APPENDIX A:
DATA SOURCES

The primary source of data for this report was the American Medical Association (AMA) Physician Masterfile. This database is the most comprehensive source of current and historical data on the demographic characteristics, professional characteristics, and practice location of physicians in the United States. Physician specialty was calculated with an algorithm used in previous studies (Escarce et al. 2000, Newhouse et al. 1982). Physicians who reported only one specialty were counted as 1.0 full-time equivalent (FTE) in the reported specialty. Physicians who reported two specialties were counted as 0.6 FTE in their primary specialty and 0.4 FTE in their secondary specialty.

Additional data were drawn from a number of sources. Information on California's population and the demographic and socioeconomic characteristics of the state were gathered from both the California Department of Finance's Demographic Research Unit and RAND's California Statistics. Data on physician income were obtained from the AMA Socioeconomic Monitoring Survey and the Community Tracking Survey. Information on county HMO penetration was obtained from Cattaeno and Stroud's report "2003 Statewide HMO and Special Programs Enrollment Study."

Data on medical students and medical school graduates were taken from the Association of American Medical Colleges and the American Association of Colleges of Osteopathic Medicine. Finally, information on physician assistants and nurse practitioners was obtained from the State of California, Department of Consumer Affairs and the American Academy of Physician Assistants' Physician Assistant Census Reports from 1996 and 2000, and the National Sample Survey of Registered Nurses, also from 1996 and 2000.

Readers should note that our data on the number of physicians may be slightly different from those found in other sources, specifically data from the California Medical Board. Our study uses the major professional activity variable on the AMA Physician Masterfile to include only active patient care physicians (unless where otherwise noted). Other sources of physician data may include all physicians, all licensed physicians, medical residents, or some other subset of the physician population. These alternate data sources yield different totals. Readers should also note that the address information on the AMA Physician Masterfile may be a home address or an office. While this is not ideal, it is a problem that is encountered in many similar data sources.

Our study includes data on all physicians who work 20 hours per week or more. The number of hours that physicians work per week varies widely, with some physicians working only part-time and others working considerably more than the typical 40 hour work week. The data are not adjusted for the number of hours worked because the AMA Masterfile does not contain information about physicians' work hours. The number of FTE physicians in California may be lower than these estimates if a significant percentage of physicians are working part-time. In addition, the AMA Masterfile is not always updated in a timely manner. The actual number of active physicians in California could be lower if the AMA Masterfile contains significant numbers of physicians who have died, retired, or relocated to other states.

Data from the Community Tracking Study Physician Survey (CTS-PS), a survey conducted by the Center for Studying Health System Change and sponsored by the Robert Wood Johnson Foundation, can provide a check on the whether physician counts from the AMA Masterfile represent the number of FTE physicians. The sampling frame of physicians contained in the CTS-PS was drawn from the universe of physicians listed in the AMA Masterfile and the American Osteopathic Association membership file. As part of the survey, physicians were asked how many hours per week they spent in medically-related activities during their last complete week of work as well as how many weeks they practice medicine per year. The product of these two figures yields estimated hours worked per year.

The design of the CTS-PS is as follows. Sixty sites (51 metropolitan areas and 9 nonmetropolitan areas) were randomly selected to form the core of the CTS and to be representative of the nation as a whole. Within each site, physicians were randomly selected from sampling frames stratified by primary care physician status (PCP and non-PCP). A supplemental sample, selected with stratified probability sampling, was included in the survey to increase the precision of national estimates. Primary care physicians were oversampled in the site sample.

The CTS-PS sample included 9 counties in California: Los Angeles, Marin, Orange, Riverside, San Bernardino, San Francisco, San Mateo, Sonoma, and Stanislaus. These counties contain approximately 54% of the population of California. While these counties were not chosen by the CTS-PS to provide information for state-level estimates,

they can be used to assess whether the physician counts contained in the AMA Masterfile are likely to represent FTE physicians

Means computed from the CTS-PS are as follows. Mean hours per week spent in medically related activities by physicians during the year 1999 were 53.8 nationally and 53.5 in the California subsample. The mean number of weeks per year spent working in medicine during 1999 was 47.7 nationally and 47.8 in the California subsample. In terms of estimated mean annual hours, this represents 2566.3 hours nationally and 2557.3 hours in the California subsample, both well above the standard 2000 hours per year represented by a 40-hour workweek for 50 weeks per year. If the physicians in the California subsample are representative of California's physicians, the AMA Masterfile counts of physicians probably provide reasonable estimates of the number of FTE physicians in the state.

APPENDIX B:
ACTIVE PATIENT CARE PHYSICIANS AND PHYSICIANS PER 100,000
POPULATION IN CALIFORNIA BY COUNTY, 2002

Table B.1

Active, Patient Care Physicians and Physicians Per 100,000 Population in California By County, 2002

County	Number of Physicians			Physicians Per 100,000 Population		
	All Physicians	Generalists	Specialists	All Physicians	Generalists	Specialists
Alameda	3,264	1,314	1,833	220	88	123
Alpine	0	0	0	0	0	0
Amador	59	33	23	164	92	63
Butte	395	148	237	191	71	114
Calaveras	32	20	11	77	48	27
Colusa	12	7	4	62	37	23
Contra Costa	2,080	798	1,219	212	81	124
Del Norte	48	24	20	173	87	74
El Dorado	258	108	143	158	66	88
Fresno	1,358	551	773	164	67	93
Glenn	9	5	3	34	17	13
Humboldt	279	112	153	219	88	120
Imperial	107	40	60	71	27	40
Inyo	37	20	15	203	112	82
Kern	850	352	478	123	51	69
Kings	112	56	52	84	42	39
Lake	73	39	29	121	64	49
Lassen	27	15	10	79	45	30
Los Angeles	20,093	7,221	12,163	205	74	124
Madera	117	61	52	90	46	40
Marin	1,157	366	748	466	147	301
Mariposa	8	5	2	47	32	12
Mendocino	180	80	92	205	91	105
Merced	206	97	104	94	44	47
Modoc	6	4	2	64	39	26
Mono	24	6	18	181	48	133
Monterey	675	264	383	165	65	94
Napa	388	128	237	303	100	185
Nevada	213	84	120	224	89	126
Orange	6,865	2,590	4,064	234	88	139
Placer	648	284	350	244	107	132
Plumas	30	17	11	143	82	53
Riverside	1,927	778	1,085	117	47	66
Sacramento	2,505	904	1,532	196	71	120
San Benito	41	20	19	74	37	34
San Bernardino	2,413	960	1,374	135	54	77
San Diego	6,748	2,315	4,177	232	80	144
San Francisco	3,550	1,225	2,185	450	155	277
San Joaquin	770	346	409	129	58	68
San Luis Obispo	617	203	390	244	80	154
San Mateo	1,917	634	1,224	268	89	171
Santa Barbara	946	350	571	233	86	140

Table B.1 (continued)						
Santa Clara	4,214	1,596	2,470	245	93	144
Santa Cruz	597	233	335	231	90	130
Shasta	414	155	251	245	92	148
Sierra	0	0	0	0	0	0
Siskiyou	66	36	26	149	81	58
Solano	645	271	355	159	67	88
Sonoma	1,069	446	591	228	95	126
Stanislaus	681	296	370	145	63	79
Sutter	168	82	84	206	100	102
Tehama	56	26	29	98	46	51
Trinity	12	10	2	92	74	15
Tulare	418	188	216	110	50	57
Tuolumne	99	42	54	177	75	96
Ventura	1,403	561	796	180	72	102
Yolo	459	183	266	260	104	151
Yuba	75	33	40	43	18	22
Total	71,420	26,742	42,260	204	76	121

Note: 1) The numbers of generalists and specialists do not sum to the total number of physicians in each county because some physicians do not report their specialties.
2) These data may not be consistent with physician data found in other sources, because we included only active, patient care physicians in our analysis. Active, patient care physicians are those who work 20 or more hours per week and whose primary professional activity is patient care.

Source: Petris Center Analysis of the AMA Physician Masterfile. Population data were taken from the California Department of Finance.

APPENDIX C:
**COMPARING ACTIVE PATIENT CARE PHYSICIANS AND LICENSED
PHYSICIANS IN CALIFORNIA BY COUNTY, 2002**

Table C.1

Comparing Active Patient Care Physicians and Licensed Physicians
in California By County, 2002

County	Active Patient Care Physicians		Licensed Physicians	
	Number of Physicians	Physicians Per 100,000 Population	Number of Physicians	Physicians Per 100,000 Population
Alameda	3,264	220	3,882	260
Alpine	0	0	0	0
Amador	59	164	59	160
Butte	395	191	449	220
Calaveras	32	77	50	120
Colusa	12	62	12	60
Contra Costa	2,080	212	2,569	260
Del Norte	48	173	55	200
El Dorado	258	158	274	170
Fresno	1,358	164	1,640	200
Glenn	9	34	9	30
Humboldt	279	219	302	240
Imperial	107	71	124	80
Inyo	37	203	45	250
Kern	850	123	965	140
Kings	112	84	122	90
Lake	73	121	82	140
Lassen	27	79	51	150
Los Angeles	20,093	205	25,599	260
Madera	117	90	153	120
Marin	1,157	466	1,465	590
Mariposa	8	47	13	80
Mendocino	180	205	215	250
Merced	206	94	231	110
Modoc	6	64	6	60
Mono	24	181	25	190
Monterey	675	165	855	210
Napa	388	303	465	360
Nevada	213	224	255	270
Orange	6,865	234	8,065	280
Placer	648	244	777	290
Plumas	30	143	30	140
Riverside	1,927	117	2,419	150
Sacramento	2,505	196	3,466	270
San Benito	41	74	46	80
San Bernardino	2,413	135	3,041	170
San Diego	6,748	232	8,355	290
San Francisco	3,550	450	4,967	630
San Joaquin	770	129	880	150
San Luis Obispo	617	244	707	280
San Mateo	1,917	268	2,391	330

TABLE C.1 (continued)

Santa Barbara	946	233	1,128	280
Santa Clara	4,214	245	5,725	330
Santa Cruz	597	231	624	240
Shasta	414	245	479	280
Sierra	0	0	1	30
Siskiyou	66	149	80	180
Solano	645	159	710	180
Sonoma	1,069	228	1,322	280
Stanislaus	681	145	773	160
Sutter	168	206	178	220
Tehama	56	98	54	90
Trinity	12	92	10	80
Tulare	418	110	484	130
Tuolumne	99	177	124	220
Ventura	1,403	180	1,626	210
Yolo	459	260	527	300
Yuba	75	43	64	100
Total	71,420	204	89,025	254

Note: 1) The numbers of generalists and specialists do not sum to the total number of physicians in each county because some physicians do not report their specialties.
2) These data may not be consistent with physician data found in other sources, because we included only active, patient care physicians in our analysis. Active, patient care physicians are those who work 20 or more hours per week and whose primary professional activity is patient care.

Source: Petris Center analysis of the AMA Physician Masterfile and the California Medical Board. Population data were taken from the California Department of Finance.

APPENDIX D:
PRIMARY CARE HPSAs IN CALIFORNIA

Table D.1

Primary Care HPSAs in California, 2003

County	HPSA Name	Census Tracts (CTs)	Type	Urban/Rural
ALAMEDA	FCI – Dublin	Federal Prison	Facility	
ALAMEDA	Hayward Central/San Leandro East	4091-4094, 4323, 4326, 4331-4332, 4337, 4339-4340, 4354, 4356-4357, 4363, 4366, 4374-4375, 4377-4381, 4382.02, 4402, 4403.01	Geographic	Urban
ALAMEDA	Oakland South	4061-4062, 4065-4066, 4070-4078, 4082-4089, 4095-4098, 4101-4103	Geographic	Urban
BUTTE	Feather Falls	24	Geographic	Rural
BUTTE	Oroville/Palermo	25-33	Population	Rural
BUTTE	Paradise	17-23	Population	Rural
CALAVERAS	Angels	1	Population	Rural
CALAVERAS	San Andreas	2 & 3	Population	Rural
CALAVERAS	West Point-Wilseyville	4 & 5	Population	Rural
COLUSA	Central Colusa, West Colusa	1, 3, 4	Geographic	Rural
COLUSA	East Colusa	2 & 5	Geographic	Rural
CONTRA COSTA	Antioch North/Pittsburg North	3050, 3071.02, 3072.01-3072.02, 3072.04-3072.05, 3090, 3100, 3110, 3120, 3132.01-3132.02, 3141.01-3141.02, 3142, 3142.98, 3552	Population	Urban
DEL NORTE	Entire County	1, 1.99, 2	Population	Rural
EL DORADO	Georgetown	306.03	Geographic	Rural
EL DORADO	Pollock Pines	314.01-314.03 and 316.98	Geographic	Rural
EL DORADO	South Lake Tahoe	301.01-301.02, 302-303, 304.01-304.02, and 305.01-305.03	Population	Rural
FRESNO	Caruthers-Raisin City	75-76	Geographic	Rural
FRESNO	Coalinga	79.98, 80-81 and 87.98	Population	Rural
FRESNO	Edison-Easton	2-4, 7-13, 15, 18-20, 38.01-38.03, and 42.01	Population	Urban
FRESNO	Fowler/Kingsburg/Selma	16-17, 70.01-70.02, and 71-73	Geographic	Urban
FRESNO	Huron	78	Geographic	Rural
FRESNO	Kingsburg District Hospital (Primary Care Clinic)	1200 Smith Street, Kingsburg	Facility	
FRESNO	Laton/Riverdale	74 & 77	Geographic	Rural
FRESNO	Mendota/Firebaugh	83, 84.01 & 84.02	Geographic	Rural
FRESNO	Reedley	63, 65, 66.01-66.02, 67, 68.01-68.02 & 69	Population	Urban
FRESNO	San Joaquin	82	Geographic	Rural
FRESNO	Squaw Valley	64.01-64.03	Geographic	Rural

Table E.1 (Continued)

FRESNO	University Medical Center (Primary Care Clinic)	Primary Care Clinic	Facility	
GLENN	Willows	103-105	Population	Rural
HUMBOLDT	Eureka	1, 1.99, 106-107, 12, 2-9	Geographic	Rural
HUMBOLDT	Ferndale	112	Geographic	Rural
HUMBOLDT	Fortuna	108-110	Geographic	Rural
HUMBOLDT	Garberville	113	Geographic	Rural
HUMBOLDT	Rio Dell/Scotia	111	Geographic	Rural
HUMBOLDT	Trinity-Klamath: Willow Creek	101	Geographic	Rural
IMPERIAL	Brawley	102-107	Geographic	Rural
IMPERIAL	Calexico	119-122	Geographic	Rural
IMPERIAL	Calipatria-Westmoreland	101, 123.02	Geographic	Rural
IMPERIAL	East Imperial	124	Geographic	Rural
IMPERIAL	El Centro	108-111, 112.01-112.02, 113-117, 118.01-118.03	Geographic	Rural
IMPERIAL	INS Medical Facility - El Centro	Federal Prison	Facility	
IMPERIAL	Winterhaven/Bard	125	Geographic	Rural
INYO	Bishop	1-4	Population	Rural
INYO	Death Valley	7	Geographic	Rural
INYO	Independence	5	Geographic	Rural
INYO	Lone Pine	6	Geographic	Rural
KERN	Arvin/Lamont	62-64	Geographic	Rural
KERN	Boron/California City	55.03-55.06 & 56-59	Geographic	Rural
KERN	Buttonwillow	37	Geographic	Rural
KERN	Delano/McFarland	46-50	Population	Rural
KERN	East Bakersfield	10, 11.01-11.03, 12-15, 20-22, 23.01-23.02, 24-26, & 30	Geographic	Urban
KERN	Frazier Park	33.02	Geographic	Rural
KERN	Lake Isabella	52.01 & 52.02	Population	Rural
KERN	Shafter/Wasco	39-45	Geographic	Rural
KERN	Taft	33.03, 33.04, 34, 35 & 36	Geographic	Rural
KERN	Tehachapi	60.01-60.02 & 61	Geographic	Rural
KINGS	Avenal	17	Geographic	Rural
KINGS	Corcoran	13-16	Geographic	Rural
KINGS	Hanford/Lemoore	1-3, 4.01-4.02, and 5-12	Population	Rural
LAKE	Lakeport	1-5, and 10	Population	Rural
LAKE	Lower Lake	6-9 and 11-13	Population	Rural
LASSEN	Big Valley Division	401 Blocks 1-3	Geographic	Rural
LASSEN	Susanville: Honey Lake, Madeline Plains, Susanville, and Westwood Divisions	402-406, 401 Blocks 4 & 5	Population	Rural
LOS ANGELES	Asian Pacific Health Care Ventura	(in CT 1953)	Facility	Urban
LOS ANGELES	Baldwin Park/Bassett/W. Covina	4047-4052, 4065, 4067-4070, 4071.01-4071.02, 4074, & 4083.01	Population	Urban
LOS ANGELES	Bell	5324, 5333-5337, 5338.01-5338.02, 5343, 5344.01-5344.02	Population	Urban

Table E.1 (Continued)

LOS ANGELES	Bell Garden	5302.01-5302.02, 5318, 5319.01-5319.02, 5323.01-5323.02, and 5339-5342	Population	Urban
LOS ANGELES	City of Angels Medical Center	(in CT 1957 - MSSA 78.2g)	Facility	Urban
LOS ANGELES	East Compton	5415, 5416.01-5416.02, 5420, 5421.01-5421.02, 5422, 5424.01-5424.02, 5425-5427, and 5432	Geographic	Urban
LOS ANGELES	East Los Angeles	5303-5306, 5308-5311, 5312.01-5312.02, 5313.01-5313.02, 5315.01-5315.02, 5316.01-5316.02, 5317.01-5317.02	Population	Urban
LOS ANGELES	East San Pedro/Long Beach Port/Wilmington	2941-2949, 2949.99, 2951, 2951.99, 2961, 2961.99, 2962, 2962.99, 2971, 2971.99, 5727-5729, 5755-5757 and 5757.99	Population	Urban
LOS ANGELES	El Monte	4323-4324, 4326-4328, 4331-4335, 4337-4340	Geographic	Urban
LOS ANGELES	Exposition Park	2216-2219, 2226-2227, 2246-2247, 2267, 2284, 2311-2318, 2340, and 2342-2343	Population	Urban
LOS ANGELES	Family Health Care Clinic	(in CT 1044.02)	Facility	Urban
LOS ANGELES	FCI Terminal Island	Federal Prison	Facility	Urban
LOS ANGELES	Florence/Firestone	2395-2398, 2400, 2402, 2405-2407, 5349-5350, 5351.01-5351.02, and 5353-5354	Geographic	Urban
LOS ANGELES	Harbor-UCLA Medical Center (Ambulatory Clinics)	(in CT 5435.03)	Facility	Urban
LOS ANGELES	Highland Park	1831.01-1831.02, 1832-1833, 1835-1838, 1991, 1992.01-1992.02, 1993, 1998, 2011-2012, 2013.01-2013.02, 2014.01-2014.02, 2015.01-2015.02, 2016-2017, 5307	Population	Urban
LOS ANGELES	Huntington Park	2281-2282, 2287-2289, 2291, 5325, 5326.01-5326.02, 5327-5330, 5331.01-5331.02, 5332, 5345, 5347, 5348.01-5348.02	Geographic	Urban
LOS ANGELES	INS Medical Facility - San Pedro	Federal Prison	Facility	Urban
LOS ANGELES	Lake Los Angeles	9001-9003	Geographic	Rural
LOS ANGELES	Littlerock	9100, 9109, and 9110	Geographic	Rural
LOS ANGELES	Long Beach Comprehensive Health Center	(in CT 5754)	Facility	Urban
LOS ANGELES	Los Angeles Mission Community Clinic	311 Winston St, Los Angeles 90013	Facility	Urban
LOS ANGELES	MDC Los Angeles	Federal Prison	Facility	Urban
LOS ANGELES	Mission Hills/San Fernando	1042.01-1042.02, 1044.01-1061.02, 1064.01, 1066.01-1066.02, 1070, 1091, 1094-1095, and 3201-3203	Population	Urban
LOS ANGELES	North Hollywood	1224, 1230, 1231.02, 1232.01-1232.02, 1233.01, 1239, 1241.01-1241.02, 1242.01-1242.02, 1243, and 1252-1256	Population	Urban

Table E.1 (continued)				
LOS ANGELES	Pacoima/Sun Valley North	1041.01-1041.02, 1043, 1044.02, 1045-1046, 1047.01-1047.02, 1048, 1210-1212, 1218-1219, and 1221-1222	Population	Urban
LOS ANGELES	Pasadena North Central/North West	4609-4611, 4615-4616, 4619-4624, and 4627-4628	Population	Urban
LOS ANGELES	Pico Rivera South	5007-5009, 5023-5025, 5026.01-5026.02, and 5320-5322	Population	Urban
LOS ANGELES	Pico Union/Westlake	2083-2088, 2089.01-2089.02, 2091.01-2091.02, 2092-2093, 2094.01-2094.03, 2095, 2100, 2111-2113, 2119, 2121, 2122.01-2122.02, 2123.01, 2134.01-2134.02, 2211, 2242-2244, and 2098	Population	Urban
LOS ANGELES	Pomona Central	4020, 4023.01-4023.02, 4024.01-4024.02, 4025.01-4025.02, 4026, 4027.01-4027.02, 4028, 4029.01-4029.02, 4030, and 4088 (in CT 9201.02)	Geographic	Urban
LOS ANGELES	Samuel Dixon's Family Health Center	5990 & 5991	Facility	Urban
LOS ANGELES	Santa Catalina Island		Geographic	Rural
LOS ANGELES	South Central Northeast	2283, 2285-2286, 2292-2294, 2319, 2321, 2327-2328, 2371, 2374-2376, and 2392-2393	Population	Urban
LOS ANGELES	South Central Southwest	2377-2378, 2380, 2382-2384, 2403-2404, 2411-2412, 6001, 6002.01-6002.02, 6003.01-6003.02, and 6004 (in CT 5421.02)	Geographic	Urban
LOS ANGELES	UHP Compton Medical Center (Adult Medicine, Pediatric, OB-GYN, and Urgent Care Clinics)		Facility	Urban
LOS ANGELES	Van Nuys Central	1233.02, 1234-1235, 1236.01-1236.02, 1237-1238, 1271.01-1271.02, 1272-1274, 1276.01-1276.02, 1277, 1278.01-1278.02, 1279, 1281-1282, and 1283.01	Population	Urban
LOS ANGELES	Venice/South Santa Monica	2722, 2723.02, 2731-2739, 2751-2752, 2755, 7018.01-7018.02, 7019-7021, 7022.01-7022.02, 7026, and 7028.03 (in CT 2427)	Population	Urban
LOS ANGELES	Watts Health Center (Adult Medicine, Pediatric, OB-GYN, and Urgent Care Clinics)		Facility	Urban
LOS ANGELES	Watts/Willowbrook	2408-2410, 2420-2423, 2426-2427, 2430-2431, 5352, 5404, 5406-5408, and 5412-5414	Geographic	Urban
LOS ANGELES	West Adams	2184-2190, 2193, 2195, 2197-2201, 2214-2215, 2220-2222, 2225, 2361, and 2362.01-2362.02	Geographic	Urban
MADERA	Chowchilla	79.2: CTs 2-3	Population	Rural
MADERA	Madera West/Southwest	4, 5.02-5.05, 6.01-6.02, and 7-10	Geographic	Rural

Table E.1 (continued)				
MADERA	Oakhurst	1.02-1.05	Geographic	Rural
MARIN	Bolinas, Stinson Beach Inverness, Point Reyes, National Seashore	1321-1322	Geographic	Rural
MARIPOSA	Coulterville	2	Geographic	Rural
MARIPOSA	Mariposa	1 & 3	Geographic	Rural
MENDOCINO	Boonville	112	Population	Rural
MENDOCINO	Covelo	101	Geographic	Rural
MENDOCINO	Laytonville/Leggett	102	Geographic	Rural
MENDOCINO	Redwood Coast Medical Services	Primary Care Clinic	Facility	
MENDOCINO	Willits	106 and 107	Population	Rural
MERCED	Delhi-Livingston	2, 3.01, 3.03, 3.04, and 4	Geographic	Rural
MERCED	Los Banos/Dos Palos	21.98, 22, 23.01-23.02, and 24	Population	Rural
MERCED	USP Atwater	Federal Prison	Facility	
MODOC	Adin/Lookout Division	101, Blockgroup 2	Geographic	Rural
MODOC	Alturas Division	102, Blockgroup 1	Geographic	Rural
MODOC	Surprise Valley Division	101, Blockgroups 6 & 7	Geographic	Rural
MODOC	Tule Lake	101.001	Geographic	Rural
MONTEREY	Gonzales/Greenfield/Soledad	108.98, 109, & 111-112	Geographic	Rural
MONTEREY	King City	113 & 114.02	Population	Rural
MONTEREY	Natividad Family Health Center	Blanco Circle	Facility	
MONTEREY	Natividad Medical Center	Constitution Blvd	Facility	
MONTEREY	Natividad Professional Plaza (Women's Health Center)	Alvin Drive	Facility	
ORANGE	Anaheim Central	18.02, 116.01-116.02, 117.19-117.20, 865.01-865.02, 866.01-866.02, 866.01-866.02, 867.01-867.02, 871.02, 871.04, 872-873, 874.01-874.03, and 875.01	Population	Urban
ORANGE	Central Santa Ana	744.05, 745.01, 746.01-746.02, 747.01-747.02, 748.01-748.02, 748.05-748.06, 749.01-749.02, 750.01-750.02, 751, & 752.01-752.02	Population	Urban
PLACER	Colfax	219.01-219.02 and 220.02	Geographic	Rural
PLACER	Foresthill	202	Geographic	Rural
PLACER	Placer County Community Clinic	C Avenue, Auburn	Facility	
PLUMAS	Chester	4 and 5.98	Geographic	Rural
PLUMAS	Quincy	1 and 2	Geographic	Rural
RIVERSIDE	Mecca	456.01-456.02	Population	Rural
RIVERSIDE	Palm Desert	445.01-445.02, 449.02-449.03, 450, 451.02-451.04, and 452.01	Population	Urban
RIVERSIDE	Riverside Downtown	301-305, 401-403, 422.01-422.03, and 423	Geographic	Urban

Table E.1 (continued)				
SACRAMENTO	Fruitridge/Oak Park	17-18, 27-30, 31.01-31.02, 32.01-32.02, 36-37, 44.01-44.02, 45, 46.01-46.02, 47, 48.01-48.02, 50.01-50.02, 51.01-51.03	Geographic	Urban
SAN BENITO	Hollister	1.98, 2-7 and 9	Geographic	Rural
SAN BENITO	San Benito/Bitterwater	8	Geographic	Rural
SAN BERNARDINO	Twentynine Palms/Yucca Valley	104.02-104.03 & 104.05-104.09	Geographic	Rural
SAN BERNARDINO	Big Bear Lake	111-115	Population	Rural
SAN BERNARDINO	FCI Victorville	Federal Prison	Facility	
SAN BERNARDINO	Fontana East/Bloomington	28-34, 35.01-35.02, 36.02 and 40	Population	Urban
SAN BERNARDINO	Lake Arrowhead	108-110	Geographic	Rural
SAN DIEGO	Borrego Springs	210	Geographic	Rural
SAN DIEGO	City Heights	14-15, 22-24, 25.01-25.02, 26, 27.01, 27.04-27.06, 34.01, 42-44, 53-58, 58.99, and 59-61	Population	Urban
SAN DIEGO	El Cajon	153.01-153.02, 156.01-156.02, 157.01-157.02, 158-161, 162.01-162.02, 163, 164.01-164.02, and 165.01-165.02	Population	Urban
SAN DIEGO	Fallbrook	187, 188.01-188.03, 189.01-189.02, and 190	Population	Rural
SAN DIEGO	Golden Hill/Logan Heights	34.02, 35-36, 38, 38.99, 39-41, 45-49, 50, 50.99, 51, 51.99, & 52	Population	Urban
SAN DIEGO	INS Medical Facility - Otay Mesa	Federal Prison	Facility	
SAN DIEGO	Julian/Pine Valley	209.01-209.02	Geographic	Rural
SAN DIEGO	MCC San Diego	Federal Prison	Facility	
SAN DIEGO	Mountain Empire	211	Geographic	Rural
SAN DIEGO	National City Family Clinic	1136 D Avenue, National City, 91950 (in CT 117, MSSA 161g)	Facility	
SAN DIEGO	Oceanside West/Carlsbad West	173.03-173.04, 174.01, 175, 177, 178.01, 178.05, 179-184, 185.01, 185.04, 186.01, and 186.03	Population	Urban
SAN DIEGO	San Ysidro	100.01-100.05, 100.07-100.09, 101.03-101.04, 101.06-101.09, & 102-105	Geographic	Urban
SAN DIEGO	Vista East/San Marcos North	192.02-192.04, 195, 196.01-196.02, 197.02, 199.02-199.03, 200.05-200.07, and 200.09	Population	Urban
SAN FRANCISCO	South of Market	122-125, 176.02, 176.98, 177-178, 179.01-179.02, 179.99, 180, 201.98, 226-229, and 607	Geographic	Urban
SAN JOAQUIN	Escalon/Manteca/Ripon	49.01, 49.98, 50.01-50.02, 51.01, 51.06, & 51.08-51.20	Population	Urban
SAN JOAQUIN	Stockton East and South	1-3, 5-8, 8.99, 16-26, 27.01-27.02, 28-29, 36.01-36.02, and 37-39	Geographic	Urban
SAN LUIS OBISPO	Arroyo Grande	117-124	Population	Rural

Table E.1 (continued)				
SAN LUIS OBISPO	Atascadero	125-126	Population	Rural
SAN LUIS OBISPO	Paso Robles	100-103	Population	Rural
SAN MATEO	East Menlo Park/East Palo Alto	6117-6121, and 6121.98	Population	Urban
SANTA BARBARA	FCI - Lompoc	Federal Prison	Facility	Rural
SANTA BARBARA	Guadalupe	25	Geographic	
SANTA BARBARA	USP - Lompoc	Federal Prison	Facility	
SANTA CRUZ	Watsonville	1101-1103, 1104.98, 1105-1107, 1223, 1224.97-1224.98, 1225.98, 1228.88-1228.90, and 1230.98	Population	Rural
SHASTA	Anderson/Anderson/Cottonwood	120-123	Population	Rural
SHASTA	Burney	127	Geographic	Rural
SHASTA	Central Shasta: Shingletown	126	Geographic	Rural
SHASTA	Sacramento Canyon/Castella/Lakehead/O'Brien	125	Geographic	Rural
SHASTA	Shasta Primary Care Clinic	(in MSSA 189.2)	Facility	Rural
SHASTA	Southwest Shasta/French Gulch/Whiskeytown	124, 128.97-128.98	Geographic	
SIERRA	West Sierra Division: Downieville	100, Blockgroups 5 and 7-8	Geographic	Rural
SISKIYOU	Butte Valley/Dorris	2	Geographic	Rural
SISKIYOU	Etna/Ft. Jones	6 & 8	Geographic	Rural
SISKIYOU	Happy Camp	5	Geographic	Rural
SISKIYOU	McCloud-Medicine Lake	12	Geographic	Rural
SISKIYOU	Tule Lake	1	Geographic	Rural
SISKIYOU	Yreka	3 & 7	Population	Rural
SONOMA	Cloverdale	1541-1542	Geographic	Rural
SONOMA	Guerneville	1537.01-1537.02, 1543 & 1543.99	Geographic	Rural
SONOMA	Petaluma	1506.01-1506.04, 1507-1511, 1512.01-1512.02, 1513.01-153.04	Geographic	Urban
SONOMA	Sonoma Valley	1501-1502, 1503.01-1503.02, and 1504-1505	Geographic	Rural
STANISLAUS	Hughson	28, 29.01-29.02	Population	Rural
STANISLAUS	Newman/Patterson	32, 33.98, 34.98 & 35	Geographic	Rural
STANISLAUS	Oakdale	1, 2.01-2.02, and 42.98	Population	Rural
STANISLAUS	Turlock	36.02-36.05, 37, 38.01-38.03, 39.03-39.07	Population	Urban
SUTTER	Yuba City	501.01-501.02, 502.01-502.02, 503.01-503.02, 504, 505.01, 505.03-505.04, 506.01, 506.03-506.04, and 508-510	Population	Rural
TEHAMA	Corning	9-11 and 12.98	Geographic	Rural
TEHAMA	Red Bluff	2 and 4-8	Population	Rural
TRINITY	Mad River/Ruth/Zenia	4	Geographic	Rural

Table E.1 (continued)				
TULARE	Dinuba/Orosi/Cutler	2, 3.02, 3.98, and 4-6	Geographic	Rural
TULARE	Earlimart/Pixley/Tipton	32 and 42-44	Geographic	Rural
TULARE	Lindsay	8, 14-16, 25-26, and 28	Population	Rural
TULARE	Porterville/Springville	27, 33-41 & 45	Geographic	Rural
TULARE	Tulare	21-22, 23.01-23.02, 24, 29.01-29.02, and 30-31	Population	Rural
TULARE	Woodlake/Three Rivers	1 and 7	Geographic	Rural
VENTURA	Oxnard North Central	30.01-30.02, 31-32, 34.01-34.02, 35, 37-39, 41, 45, 49, and 50.01-50.02	Population	Urban
VENTURA	Oxnard West/Ventura South (Simplified)	24-27, 28.01-28.02, 29, 33, 36.03-36.06, 42, and 43.01-43.02	Population	Urban
VENTURA	Santa Paula	1-8	Population	Urban

Note: This list represents designated shortage areas from applications for designation received, processed, and approved by the Federal Shortage Designation Branch. It does not include eligible areas that have not applied for designation.