

UNIVERSITY OF CALIFORNIA
HEALTH SCIENCES EDUCATION

WORKFORCE NEEDS AND ENROLLMENT PLANNING

Submitted by the Universitywide Health Sciences Committee



Office of Health Affairs
University of California
April 2005

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY	1
Overall Health Workforce Findings	1
Profession-Specific Findings	1
Health Sciences Committee Recommendations	2
II. INTRODUCTION	3
Background and Charge to the Health Sciences Committee	3
III. CONTEXT FOR PLANNING IN THE HEALTH SCIENCES	4
Demographic and Economic Trends	4
Access to Care and Health Disparities	6
Financing and Delivery of Health Services	6
IV. THE UC HEALTH SCIENCES INSTRUCTIONAL PROGRAM	8
Selected Achievements	9
Current Challenges	9
V. PROFESSION-SPECIFIC FACT SHEETS	11
Dentistry	12
Medicine	14
Nursing	16
Optometry	18
Pharmacy	20
Public Health	22
Veterinary Medicine	24
VI. FINDINGS	26
California Health Workforce Needs	26
California Workforce Findings for Seven Major Health Professions	26
The University of California Health Sciences Instructional Programs	28
VII. RECOMMENDATIONS	30
Increasing Health Sciences Enrollments	30
Meeting the Needs of the Underserved	32
Increasing Student and Faculty Diversity	32
Developing New Curricula and Teaching Methods	33
Recruiting and Retaining Faculty	33
Expanding Graduate, Postgraduate, and Continuing Education	34
Addressing Capital and Infrastructure Needs	34
Planning and Coordination	34
VIII. APPENDICES	36
Appendix A — Universitywide Health Sciences Committee	36
Appendix B — Universitywide Health Sciences Committee Subcommittee on Nursing	37
Appendix C — Universitywide Health Sciences Committee Subcommittee on Public Health	38
Appendix D — Acknowledgements	39
Appendix E — References	40
NOTES	48

UNIVERSITY OF CALIFORNIA HEALTH SCIENCES EDUCATION

Workforce Needs and Enrollment Planning — April 2005

EXECUTIVE SUMMARY

The University of California (UC) operates the largest health sciences instructional program in the nation, annually enrolling more than 13,000 students in fifteen schools, located on seven UC health sciences campuses. These include five schools of medicine and four smaller medical education programs; two schools each of dentistry, nursing, pharmacy and public health; and one school each of optometry and veterinary medicine. Through these programs, UC plays a critically important role in training future health professionals.

To inform decision making and help guide health sciences enrollment planning over the coming decade, former UC President Richard C. Atkinson asked Vice President for Health Affairs, Dr. Michael V. Drake, to oversee a comprehensive assessment of California's health workforce needs in each of the above professions. In turn, Vice President Drake directed the University's systemwide Health Sciences Committee (HSC), a long-standing subcommittee of the Academic Planning Council, to undertake this task. As part of this work, the HSC was asked to assess current UC health sciences programs; review recent achievements and current challenges in each profession; and make recommendations regarding the University's role and capacity to respond to current and future state needs.

The following findings and recommendations summarize the outcome of the HSC's analysis and review of California's health workforce needs as these relate to enrollment planning for UC health sciences programs.

Overall Health Workforce Findings

- The California population is growing, aging, and increasing in diversity. Already the most populous state in the nation, California is expected to grow at nearly twice the national average by 2025. California's elderly population will grow at more than twice the rate of the state's total population within the same period. By 2015, over half of the state's population will be of Hispanic or Asian descent.
- Statewide shortages of health providers currently exist in several major health professions. Looming shortages exist in others. Regional shortages of health providers that exist currently will become more serious without effective intervention.

- The demand for culturally and linguistically competent health providers is growing, fueled by increasing need and growing demand to improve access to care, reduce disparities in health status, and improve health outcomes in the most diverse state in the nation.
- California's health workforce does not reflect the ethnic diversity of its citizens. Latinos, African Americans, and Native Americans are significantly underrepresented among UC health sciences students and faculty and among clinically active health providers statewide.

Profession-Specific Findings

- The state will face a shortfall of up to 17,000 physicians (equivalent to a 15.9% shortage) by 2015. This shortage is expected as a result of rapid population growth, aging of the current physician workforce, and lack of growth in medical education programs in California – including virtually no growth within UC for more than two decades.
- California's nursing workforce crisis is serious and growing. The state currently ranks 49th in the nation in the number of nurses per capita, and predictions forecast a shortfall of 60,000 registered nurses by 2020. Significant shortages of nursing faculty are a major barrier for increasing nursing school enrollments in California's baccalaureate degree programs (offered primarily by California State University campuses and private institutions).
- In the face of increasing demand, due in part to new and emerging public health threats, recent studies have found that the public health workforce – in California and nationally – is seriously deficient in training, preparation, and size.
- California presently ranks 48th in the nation in the number of pharmacists per capita. As the population grows and ages, and as the number of prescriptions written and dispensed continues to climb, the demand for pharmacists will continue to far outweigh supply.
- Statewide demand for veterinary services is increasing rapidly, yet the rate of growth of new veterinarians is not keeping pace, ranking California 49th in the nation. Needs are increasing across the state, with unmet demand for services currently greatest in southern California.

- While no shortages of dentists or optometrists are projected over the coming decade, California will have a steady need for these professionals in order to meet ongoing demands and for new graduates (including new faculty) to replace those who are leaving practice to retire or pursue other activities.
- Reviewing health workforce needs on a regular and systematic basis as part of the University's ongoing planning and coordination in the health sciences.

In addition to findings regarding California's health workforce, this report describes achievements and major challenges in health professions education, ranging from insufficient diversity of faculty and staff, to changing requirements in teaching and patient care, to the need for new strategies and funding to address current infrastructure and capital needs.

The HSC report offers specific recommendations in each of these and other areas. In managing current programs and developing new ones, UC must continue to ensure that high quality standards are established and maintained. The Committee recognizes that although growth in UC health sciences programs will not be sufficient to meet all (or even most) state needs, an absence of growth in UC programs would severely limit options in California.

Health Sciences Committee Recommendations

To meet the growing needs of the state, California's health workforce must change in size, distribution, and preparation. As the largest health sciences instructional program in the nation, UC should continue to play a major role in training health professionals to meet societal needs. Within this context, the HSC report offers a variety of recommendations, which include:

- Increasing enrollment at existing UC schools of medicine, nursing, pharmacy, public health, and veterinary medicine, and maintaining current enrollments in UC schools of dentistry and optometry;
- Initiating planning for one or more new comprehensive educational program(s) in medicine and nursing and for a new program in veterinary medicine;
- Expanding efforts to address the needs of California's underserved groups and communities through a variety of strategies, including increased recruitment of students with a record of service and commitment to caring for the underserved and improved training to prepare students for such service;
- Increasing student and faculty diversity in the health sciences;
- Developing new curricula and teaching methods reflecting innovative educational practices and state-of-the art clinical services in a variety of patient care settings;
- Improving efforts to recruit and retain health sciences faculty;
- Identifying new plans and alternatives for funding capital and infrastructure needs; and

INTRODUCTION

This report is submitted to University of California (UC) Vice President for Health Affairs, Dr. Michael V. Drake, by the Universitywide Health Sciences Committee (HSC) in response to his request that the committee conduct a comprehensive assessment of California's current and future health workforce needs in each of the seven major health professions in which UC offers education and training. These include dentistry, medicine, nursing, pharmacy, public health, optometry and veterinary medicine. As part of this analysis, the committee was asked to summarize major findings and identify specific recommendations that the University might consider with respect to the future size and scope of UC health professions programs.

Background and Charge to the Health Sciences Committee

In response to a request from former UC President Richard C. Atkinson, Dr. Michael V. Drake, Vice President for Health Affairs, initiated an assessment of California's health workforce needs, to help guide health sciences enrollment planning and decision making over the coming decade. Vice President Drake in turn directed the University's Health Sciences Committee (HSC), a long-standing subcommittee of the Academic Planning Council, to assess current UC health sciences programs in dentistry, medicine, nursing, pharmacy, public health, optometry and veterinary medicine; review recent achievements and current challenges in each profession; and make recommendations regarding the University's role and capacity to respond to current and future state needs.

With guidance and staff support from the Office of the President's Division of Health Affairs, the HSC produced: [1] seven profession-specific white papers containing findings and recommendations relevant to state health needs and the University's health sciences programs in dentistry, medicine, nursing, pharmacy, public health, optometry and veterinary medicine; [2] an analysis and assessment of current nursing educational costs; [3] a comprehensive analysis of California's supply and projected demand for physicians, by region, through the year 2015 (conducted by the Center for Health Workforce Studies, University at Albany, State University of New York); and [4] this final HSC report, which summarizes the major findings and recommendations resulting from this comprehensive effort.

During the course of its study, the HSC reviewed current literature regarding state and national health workforce trends in each profession and analyzed enrollment and other program-specific data. The committee reviewed state and federal demographic projections, as well as data concerning the health professions in general, and health professional shortage areas in particular, collected data from a variety of

professional associations, and consulted broadly with UC health sciences faculty and senior administrators about current issues and challenges pertinent to UC programs. As part of its deliberations, the HSC considered and discussed the University's role in public health sciences education, reviewed information regarding the role of other (non-UC) California programs in training California health professionals, and discussed the growth of (and current planning efforts involving) non-UC health professions programs that have occurred in recent years. The committee engaged outside expert consultants in nursing and in medicine, and utilized profession-specific subcommittees to facilitate review of issues in nursing and public health. In completing this project, the HSC met quarterly for half-day meetings, held numerous conference calls, and benefited greatly from the contributions of committee members and others who were willing to share their time, knowledge, and expertise (see Acknowledgments).

It is important to emphasize that this project encompasses the most comprehensive health sciences review and planning effort undertaken within UC in more than two decades. The project would not have been possible without the generous support of The California Endowment, a private statewide foundation whose mission is to expand access to affordable, quality health care for underserved individuals and communities, and to promote fundamental improvements in the health status of all Californians. In completing this task, the HSC expresses its hope that this work will be useful in policy discussions and decision-making about the future size and scope of UC health professions programs and the valuable role they should continue to play in meeting the health needs of the people of California.

CONTEXT FOR PLANNING IN THE HEALTH SCIENCES

California's health workforce is vital to the health and well being of the state's 35 million residents. While advances in science and clinical care offer great promise, rapidly increasing health needs and the demands of patient care have created new challenges that are putting the state's health workforce to the test. The population is aging and increasing in diversity. State and national expenditures on health care are skyrocketing, yet millions of Californians lack health insurance and even greater numbers lack adequate access to care. Increasing levels of chronic illness and other health conditions are leading to new models of care; innovations in science and technology offer new ways to improve health outcomes; and continuing advances in health care appear limitless. Despite these gains, California health professionals face steep challenges as they work to address compelling state needs, among them:

- More than 1.5 million, or 1 in 7 adults, have diabetes.
- Nearly 3.9 million, or 1 in 8 adults and children, are living with asthma.
- 3.4 million Californians have disabilities that limit daily activities and create a variety of health needs.
- A reported 134,000 cumulative AIDS cases in 2003 ranked California second only to New York in the number of people affected by this disease.
- Twenty-three percent of California adults are obese; 30% of California children are overweight and 40% are physically unfit.

- An estimated 1.9 million students 12 years and older use illicit drugs.
- In 2003, 23% of Californians between the ages of 19 and 65 lacked any form of health insurance.
- 18.5% of California children live below the federal poverty line (\$18,850 annual income for a family of four); 14% of children under age 18 have no health insurance.

To meet these and other needs, the state's health workforce must be adequate in size, diversity, and preparation. As UC health sciences programs work to address priority health issues in the state – and as they plan for the future – a number of factors and trends affecting the state's future supply and demand for health providers must be considered. Among these are statewide and regional demographic trends; California's budget and economy; long-standing challenges in improving access to care in California's inner cities and rural areas; and growing concerns about the rising costs of health services. This section provides a brief overview of these factors as background and context for the HSC's review and planning efforts.

Demographic and Economic Trends

Population growth. One in eight Americans lives in California, making it the most populous state in the nation. By 2015, the U.S. population is expected to increase by 13.4%. California, by contrast, is expected to see 22.3% growth, varying considerably by region – from nearly 10% growth in Los Angeles County to an estimated 40% increase in the Inland Empire.

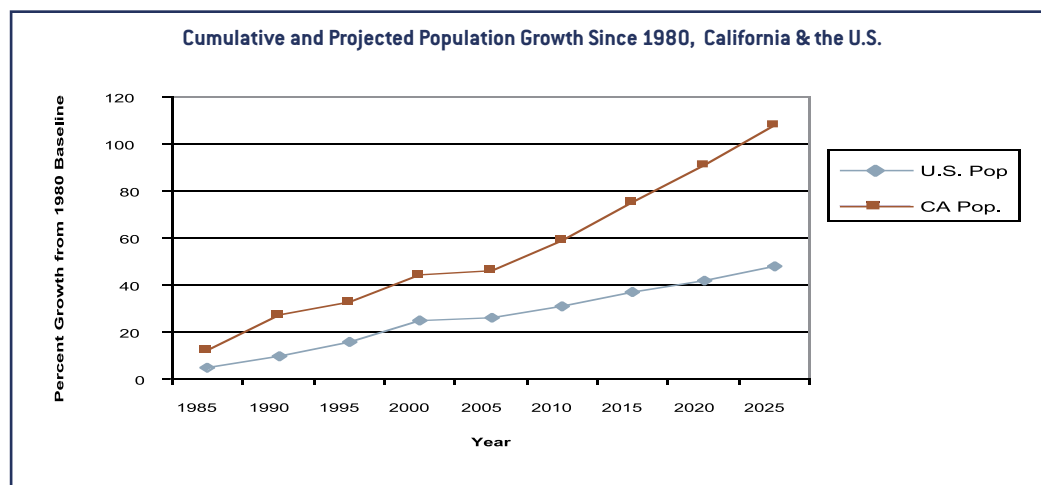


Figure 1: Population growth projections in California and the U.S.

Source: U.S. Census Bureau

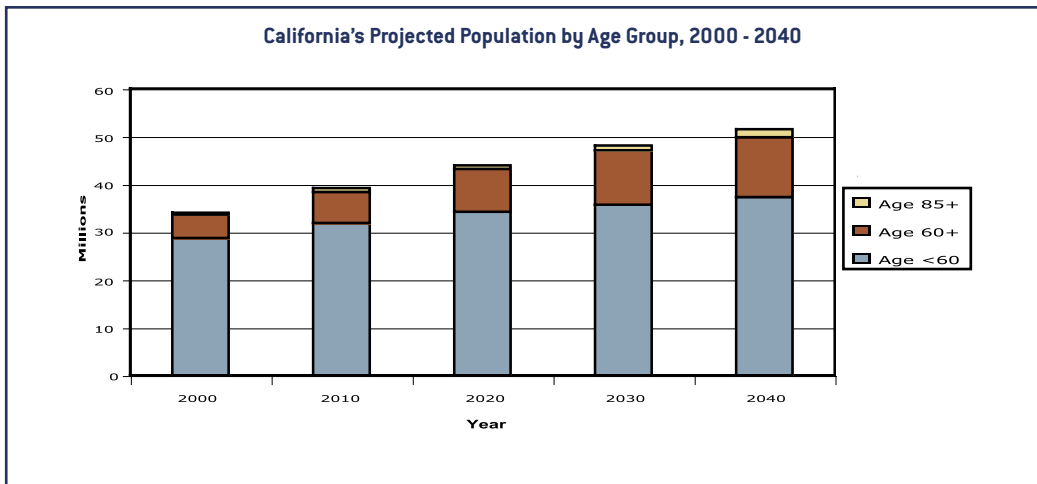


Figure 2: California population growth projections by age

Source: U.S. Census Bureau

Aging. The number of Californians aged 65 and over is already greater than any other state in the nation, and this number is expected to grow at more than twice the rate of the state's total population between now and 2020. By 2025, California is projected to have a 58% increase in people 65-74 years old, and a 49% increase in those 85 years and older. Because health needs typically increase as people age, California's growing elderly population will significantly increase the demand for health professionals to manage and provide their care.

Increasing diversity. California's population is racially and culturally more diverse than any other state in the nation, with more than 1 in 4 Californians born outside the United States – more than twice the national average of 1 in 10. Currently, the majority of Californians are non-Hispanic whites. By 2015, however, nearly 37% of the population will be of Hispanic/Latino origin, nearly 14% will be of Asian or Pacific Islander heritage, and 6% will be African American. Increasing the diversity and cultural and linguistic competence of the health workforce will thus remain a priority for meeting California's changing health needs.

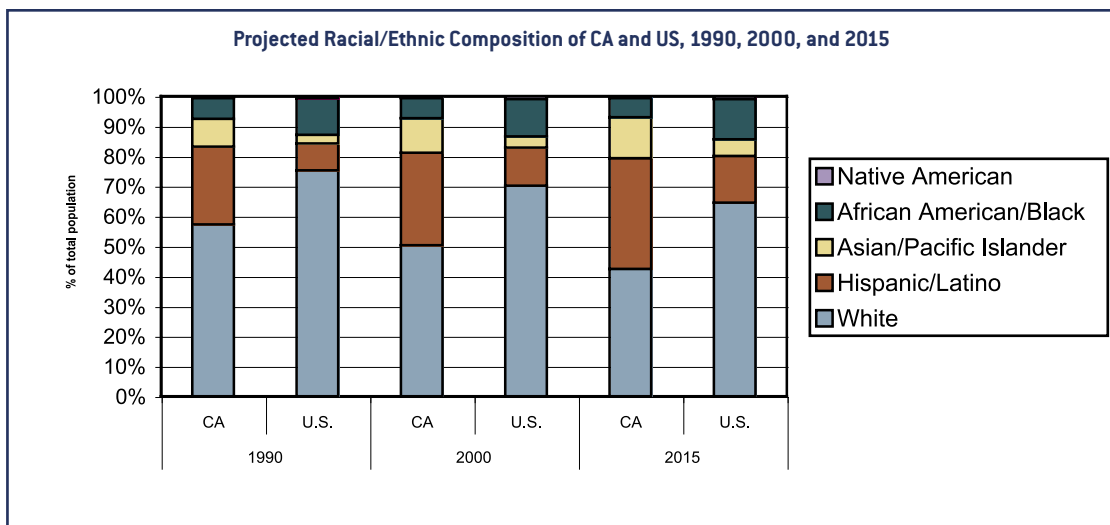


Figure 3: Race/ethnicity projections for California and the U.S.

Source: Center for Health Workforce Studies, University at Albany, State University of New York

California Demographic Trends

- The California population will grow 22.3% by 2015, much faster than the 13.4% rate of growth for the U.S.
- The elderly population will grow at twice the state's overall growth rate
- Increasing racial and cultural diversity will result in no majority group by 2015

Access to Care and Health Disparities

The leading causes of death in California mirror those of the nation as a whole (e.g., cancer, heart disease, and stroke). However, as the state's population increases, ages and diversifies, California faces unique and formidable challenges in maintaining and improving the health of its people. Over the coming decade these challenges will grow substantially unless effective strategies to improve access to health services are adopted.

Access to care. Gaps in access to care and in health outcomes are widening. Among Californians aged 19-64, 23% lack any form of health insurance, and 18.5% of California's children live below the federal poverty line (\$18,850 annual income for a family of four). Disparities in health status between California's various ethnic groups are well documented. Rates of death from diabetes are 151% higher among African Americans and 113% higher among Hispanics than among whites. Latina women have the highest risk of developing cervical cancer, accounting for one third of all invasive cervical cancers diagnosed each year. To help reduce disparities in health status, California's health workforce will require improved training and preparation for addressing the specific needs of its people.

Health professional shortage areas. California has some of the nation's largest urban areas. By 2015, more than 23 million Californians will reside in Los Angeles County, San Diego County and the San Francisco Bay Area. Many neighborhoods in these regions and most of the state's rural communities already have major difficulties in recruiting and retaining adequate numbers of health care personnel to meet current needs. 51 of California's 58 counties have at least one federally-designated Health Professional Shortage Area; two California counties have no physicians in residence and many lack sufficient numbers of other health care providers. These difficulties are expected to increase as the population grows and ages.

Burden of disease. California has high incidence rates of infectious disease and faces new and emerging health threats. Despite recent public focus on unusual threats like severe acute respiratory syndrome

(SARS), bovine spongiform encephalopathy ("mad cow" disease), and potential bioterrorism, it is the growing number of chronic conditions such as diabetes, asthma, and mental illness which impose a far greater burden on the state and its health resources. Increasing numbers of Californians are reporting poor mental health status and growing numbers are suffering from other chronic conditions. Racial and ethnic minorities collectively experience a greater burden from these illnesses, due in large part to poorer access to care. California's need for preventive health services is known to be large and unmet, and failure to make improvements will lead to higher disease rates in the future.

Health behaviors and risk factors. In all age groups, California must reverse trends in behaviors that are detrimental to good health. An estimated 1.9 million students 12 years and older use illicit drugs, and 40% of the state's children are officially labeled as physically "unfit". Obesity is rising at an alarming rate, from 9.8% to 23.2% of the total population between 1990 and 2003, increasing by 20.8% between 2002 and 2003 alone.

California Health Facts

- 23% of Californians aged 19-64 have no health insurance
- Health disparities among ethnic groups are well-documented
- 51 of 58 counties have at least one federally-designated Health Professional Shortage Area
- 23% of California adults are obese and rates of obesity are climbing
- An estimated 40% of children are physically "unfit"
- Chronic illnesses such as asthma and diabetes are widespread, especially among ethnic minorities
- 18.5% of children live in poverty
- Roughly 7% of Californians have a severe mental illness and 41% report poor mental health status

Financing and Delivery of Health Services

Rapid and constant change in the organization, delivery, and financing of health care in California profoundly affects the preparation of the health workforce. California's economy is the sixth largest in the world and the largest of any state, producing 13% of total U.S. Gross Domestic Product (GDP). Despite recent improvements, California has faced high levels of unemployment, consistently ranking in the top ten among states; millions of Californians do not have health insurance; and the costs of living in most parts of California are among the highest in the nation. These and other factors add to the complexity of financing and providing

health services, and directly affect the number and types of health providers needed in coming years.

Rising costs of health care. The costs of providing health care continue to increase rapidly nationwide. California ranks 44th in the nation in state spending on health care services as a percentage of its Gross State Product (GSP) and 38th in per capita personal health expenditures (public and private spending combined). Insurance coverage affects access to and utilization of care. Despite growing concern about the number of Californians who are uninsured – and evidence showing that uninsured patients delay treatment that often requires more costly emergency room care – overall health insurance coverage has been declining. Unrelated to patient care, but contributing to rising health care expenditures are the costs of compliance with new state and national regulatory requirements such as those mandated by the Health Insurance Portability and Accountability Act (HIPAA), and others required by law or that are necessary to meet accreditation and facility licensure requirements.

Technologic innovation in health care. As the pace of technological innovation increases, educational programs must continuously modify their curricula to teach students about new pharmaceuticals, developing technologies and recommended changes in clinical practices. As new technologies and treatment options become available, consumer demand for them increases. Meeting this demand requires recruiting and training sufficient numbers of health care providers and ensuring appropriate workforce development and continuing education. In addition, it is increasingly important to balance growth in diagnostic and treatment modalities with informed ethical discussions about the appropriateness of their use (e.g., criteria for organ transplantation). These discussions require improved training of health care professionals who are knowledgeable, sensitive and prepared to address complex ethical issues and dilemmas.

Supply of and demand for health professionals and changing scope of practice. The prevalence of managed care has led to changing needs for different numbers and types of providers. Expansion of the scope of practice, and related changes in billing and payment rights create, for some providers, (e.g., optometrists, pharmacists, nurse practitioners, physician assistants, and dental hygienists), opportunities to redefine the boundaries between professions that deliver similar services and to train an interdisciplinary workforce. The effective size of the health care workforce fluctuates over time and contributions are often difficult to quantify as providers age and as growing numbers engage in non-patient care activities. Despite this challenge, it is known that in many professions (medicine, nursing, dentistry, public health, and veterinary medicine), the number of California practitioners expected to retire within the next 15 years will outpace the number entering the workforce.

Linking teaching and training to future practice. The settings in which students are traditionally trained (i.e., academic health centers) increasingly do not reflect those in which they will eventually practice (e.g., outpatient, and managed care settings). Institutions of higher education in the state have revised their curricula and continue to expand programs to adapt to ongoing changes in the organization and delivery of health services. As UC and other programs respond, constraints imposed by affiliated (non-UC) health facilities, staffing requirements, and infrastructure issues must also be addressed.

The changing nature of health sciences education. As an enterprise, health sciences education has undergone fundamental adaptive change over the past decade to prepare health professionals to meet changing patient needs and expectations, and to practice more effectively within changing health care systems. Case-based learning, small group instruction, ongoing curricular change, and use of technology and informatics prepare students to work in a variety of settings using various integrative, interdisciplinary disease management models. The move away from lecture halls to small group instruction and ambulatory care settings, however, requires greater numbers of faculty and new and improved facilities for teaching.

Changes in Health Care Delivery

- California's economy is sixth largest in the world; total state expenditures on health are rising, yet 23% of Californians age 19-64 lack any form of health insurance
- Health services are increasingly delivered in outpatient and managed care settings, but most medical and nursing education occurs in inpatient settings (i.e., academic health centers)
- Managed care has increased demand for primary care doctors, yet shortages of specialists are also emerging

THE UC HEALTH SCIENCES INSTRUCTIONAL PROGRAM

The University of California plays a critically important role in training health professionals to meet state needs. UC operates the largest health sciences instructional program in the nation, annually enrolling more than 13,000 students in fifteen schools, located on seven UC health sciences campuses. These include five schools of medicine and

four smaller medical education programs (located in Berkeley, Fresno, Riverside, and at the Charles R. Drew University of Medicine and Science); two schools each of dentistry, nursing, pharmacy, and public health; and one school each of optometry and veterinary medicine.

Field	Schools	1st Year Professional Students	Total Budgeted Enrollment for Professional Students	Total Budgeted Residency Positions	Total		State- Supported FTE (faculty)
					Budgeted Graduate Student Positions	Total Budgeted Enrollment	
Dentistry	UCLA	88 (DDS)	352 (DDS)	50	34	436	86.33
	UCSF	80 (DDS)	320 (DDS)	31	77	428	102.42
Medicine*	UCD	93 (MD)	372 (MD)	516	115	1,003	191.62
	UCI	92 (MD)	368 (MD)	581	93	1,040	186.63
	UCLA	165 (MD)	732 (MD)	1500	220	2,452	444.28
	UCSD	122 (MD)	488 (MD)	402	226	1,116	211.28
	UCSF	153 (MD)	612 (MD)	1,000	495	2,115	364.50
Nursing	UCLA	–	–	–	265	265	33.10
	UCSF	–	–	–	598	598	75.42
Optometry	UCB	65 (OD)	255 (OD)	11	23	289	22.96
Pharmacy**	UCSD	25 (PharmD)	50 (PharmD)	10	10	70	3.74
	UCSF	117 (PharmD)	456 (PharmD)	34	77	567	55.81
Public Health	UCB	129 (MPH)	259 (MPH)	8	149	416	50.08
	UCLA	168 (MPH)	337 (MPH)	16	211	564	64.87
Veterinary Medicine	UCD	131 (DVM)	524 (DVM)	90	181	795	132.50
Totals	15	1,428	5,125	4,249	2,774	12,154	2,025.54

Figure 4 UC Health Sciences Schools – Enrollment Overview (2003-2004 Academic Year)

NOTE: This table excludes a small number of budgeted enrollments and related faculty in non-professional, non-degree programs that receive state support.

* Enrollment figures for UCLA include 24 medical students per year in the joint UCLA-Drew program; 24 medical students per year in the joint UCLA-UCR program; and 170 total budgeted Drew medical residents. Enrollment figures for UCSF include 12 medical students per year in the joint UCSF-UCB program; and 130 total budgeted residents for the UCSF-Fresno medical education program.

** Enrollment figures for UCSD reflect the fact that the school admitted its first class of 25 students in fall of 2002; UCSD's first-year and total enrollments will increase to 60 first-year students per year by fall of 2005, resulting in a total enrollment of 240 students by fall 2008.

Selected Achievements

UC makes significant contributions to California and to health sciences education, attracting top students and providing state-of-the-art education and training. The UC system is a nationwide leader in providing interdisciplinary opportunities for clinical and research experience, and in the preparation of both future faculty and future leaders in research, industry, and public service. The UC system consistently attracts high levels of federal and private research funding. The work of UC researchers has led to advances in the understanding and treatment of disease, the development of new technologies and industries, and to national and international recognition, including awards from the National Institutes of Health and the Nobel Foundation.

UC Health Sciences Schools Ranked in the Top 15 in NIH Funding Received, 2002		
Profession	Campus	National Rank
Dentistry	UCSF	1
	UCLA	13
Medicine	UCSF	4
	UCLA	9
	UCSD	15
Nursing	UCSF	2
	UCLA	12
Optometry	UCB	1
Pharmacy	UCSF	1
Public Health	UCB	10
	UCLA	14
Veterinary Medicine	UCD	1

Figure 5 Nationwide ranking of UC health sciences schools in NIH funding
 Source: National Institutes of Health

Current Challenges

In California and nationally, health sciences education as an enterprise faces ongoing challenges. Among those most relevant to UC are: the

consequences of major, multi-year budget reductions; rising student fees; current and looming faculty shortages; and ongoing challenges in keeping pace with the volume and complexity of health sciences knowledge and changes within the health care delivery system. Health care provider roles are increasingly complex, and patients approach health care issues armed with heightened expectations regarding drugs and treatment options. The California population is increasingly diverse, requiring improved cultural and linguistic competence on the part of all providers. Changes such as these require that health sciences education cut across traditional, discipline-specific boundaries and increasingly emphasize interdisciplinary, patient-centered care.

Multi-year budget cuts. By the 2004-2005 fiscal year, the University will have sustained nearly \$490 million in base budget reductions; another \$420 million in cuts will have been offset with student fee increases, and an additional \$550 million gap reflects the absence of funding for cost-of-living adjustments, non-salary price increases, employee health benefit increases, and other expenses. With the exception of nursing (exempted by the Governor and Legislature from budget cuts in 2004-05), UC health sciences schools have experienced multi-year, permanent cuts – including an approximately 25% permanent reduction in state support for instruction in 2004-05 alone. As UC schools manage these cuts, they face increasing demands for faculty productivity in clinical settings; near-term shortages of faculty; and new challenges in balancing time for teaching and research.

Faculty productivity and shortages. Collectively and individually, UC health professions training programs have achieved top national rankings in the breadth of their research portfolios, their success in competing for research grants, the quality of their faculty, and their ability to attract outstanding students. Despite these achievements, shortages of health sciences faculty are anticipated within the next few years. Factors affecting the supply of teachers and researchers include: large numbers of retirements; UC’s inability to offer and maintain competitive salaries; growing demands for both clinical and research productivity that result in less time for teaching; and expectations that faculty will continually incorporate new and complex knowledge and technologies into teaching methods and curricula.

Accreditation and licensure requirements. UC has a unique role as a public institution with obligations to train and provide care to Californians. UC operates the fifth-largest health care delivery system in California, with more than 18,000 health care professionals on staff who annually provide \$3 billion in patient care services (FY 2002-2003). A major provider to uninsured and underinsured patients in Sacramento, San Diego and Orange Counties, the UC system has current educational affiliation arrangements with more than 100 county, Veterans Affairs, and community-based health facilities throughout California.

To maintain quality and ensure competitiveness, clinical education at UC must respond to shifting societal expectations, continuing advances in science and clinical care, and changing educational accreditation and professional licensure standards. Meeting these standards requires rigorous documentation, creative curriculum development, and identification of cost-effective strategies for reducing work hours and enhancing education. These activities are mandated by accrediting bodies and/or state and federal regulations, but are not funded or reimbursed, placing still greater demands on faculty time. Pressure to enhance productivity by shortening patient visit times and to contain costs by performing more medical procedures in outpatient settings frequently reduces the time available for teaching and learning.

Limited enrollment capacity. Reflecting national trends, applications to UC health sciences schools have risen significantly in three of the health professions (nursing, pharmacy, and public health). In dentistry and optometry, applications have recently increased slightly. In medicine and veterinary medicine, UC health sciences schools consistently receive far more applications from qualified candidates than can be accommodated. UC medical schools, for example, receive between 4000 and 6000 applications (per school) to fill an entering class of 100 to 150 students. The UC Davis School of Veterinary Medicine also receives a high number of applications, averaging 900-1000 applications for a class of 131. The absence of enrollment growth in most all UC health sciences programs limits the University's ability to meet increasing state needs and to accommodate growing numbers of highly qualified California students.

**To Meet Existing Challenges,
UC Health Sciences Schools Must:**

- Adopt new strategies to recruit and retain faculty
- Maintain high quality teaching, research and patient care programs while managing multi-year permanent budget cuts
- Continue to develop new teaching methods for use in changing clinical settings
- Identify new strategies for meeting capital and infrastructure needs

PROFESSION-SPECIFIC FACT SHEETS

This section provides two-page profession-specific overviews of workforce issues, educational programs, and the strengths of — and challenges faced by — UC's health sciences programs.

DENTAL EDUCATION

Oral Health Infrastructure

The oral health system includes teams of dentists, dental hygienists, and dental assistants who deliver services in independent practices and clinics. Their efforts focus on the diagnosis, prevention, and treatment of oral diseases.

Approximately 93% of professionally active dentists work in private practices. Public health clinics, dental and dental hygiene schools, hospitals, nursing homes, and mobile van and school-based programs also serve as primary sources of care for many who would otherwise have no access to care. The current dental practice model is structured to serve insured patients or those who are able to pay cash for care they receive. Since 1960, these two sources have financed more than 90% of all dental expenditures. It is estimated that 40% of Californians have no form of dental coverage.

Dental Workforce and Projections

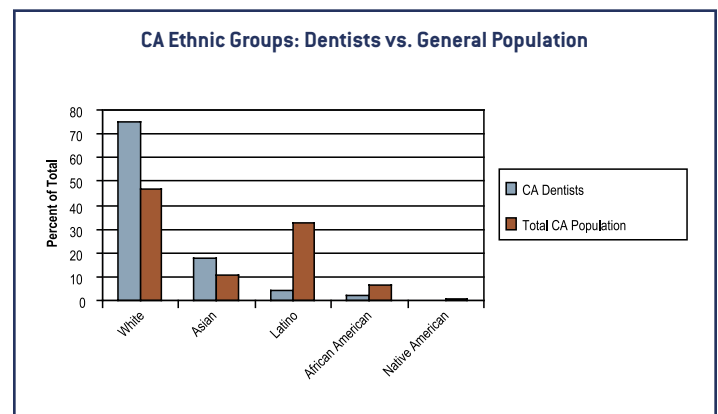
There are approximately 165,000 professionally active dentists in the United States. The number of dentists has been increasing for the past 20 years, however, it has not kept pace with overall population growth, resulting in a declining dentist-to-population ratio. This ratio is expected to drop from 60.4 to 53.7 per 100,000 over the next 15 years, due to the increasing rates of retirement of older dentists and the absence of an increase in graduates entering the workforce to replace them.

In 1999, approximately 23,000 dentists were licensed to practice in California. This total was equivalent to 68.3 dentists per 100,000 population, which exceeds the 1999 national average of 60.4 per 100,000. Nearly 60% of licensed dental practitioners in California received their dental degree at one of the five dental schools in California. California's five dental schools train more dentists than most other states and the supply appears to be adequate. However, the challenges linked to maldistribution of dentists remain unsolved. By federal standards, 20% of California communities have a shortage of dentists. More troubling still are the 32 Medical Service Study Areas in the state with no dentist at all.

Demographic Profile of Dentists

The average age of a practicing dentist in California is 48 years. Although women represent only 11% of California dentists over age 40, they now account for 34% of dentists under age 40, reflecting the growing number of female graduates in recent years.

The dental workforce is among the least diverse of the health professions. An estimated 13% of dentists nationwide are non-white compared with 29% of the U.S. population. Among dental practitioners, only 6.8% are underrepresented minorities compared with 24.8% of the U.S. population.



Ethnic Profile of Dentists in CA (2001)

Factors Affecting Demand for Dental Services

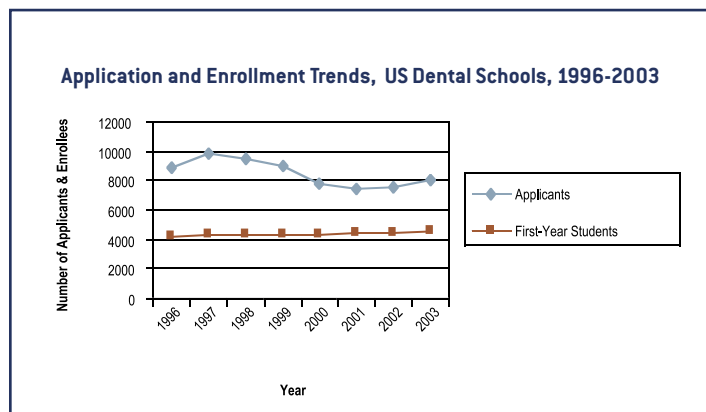
- Growth of the aging population
- Growth of the pediatric population
- Geographic maldistribution of oral health providers across the state
- Few California communities have fluoridated water supplies
- Rise in popularity of cosmetic dental procedures and new technologies

Factors Affecting Supply of Dentists

- Financial considerations such as high training costs, increased debt loads, lack of dental insurance among various population groups, and high operational costs of dental practice
- Aging of the dental workforce
- Increasing shortages of dental school faculty
- Expanded use of allied professionals

Dental Education

Currently, 56 accredited dental schools in the U.S. enroll approximately 17,800 pre-doctoral Doctor of Dental Sciences (DDS) students across a four-year educational period.



Five dental schools in California enroll approximately 2,200 students annually. The number of applications consistently exceeds the capacity of California’s training programs.

Dental Education “Fast Facts”- California

School of Dentistry	UCLA	UCSF	UOP	USC	LLU
Applications	1191	1231	1764	1622	1110
URM Applications	107	103	122	116	77
First-Year Enrollees	88	80	156	144	104
URM First-Year Enrollees	4	12	10	4	7
Total Enrollment	366	351	444	625	395
Total URM Enrollment	20	39	25	24	36
DDS Graduates	86	100	150	174	103
URM Graduates	1	15	6	2	5
First-Year Residents	45	26	18	35	20
Total Residents	79	72	25	97	46
Total Faculty	185	207	210	N/A	390
Total URM Faculty	1	15	6	2	5
Degrees Offered	DDS	DDS	DDS	DDS	DDS
	MS	MS		MS	MS
	PhD	PhD		MBA	PhD
	MBA				

Strengths of UC Dental Schools

Excellence in Training. The UC dental schools are recognized for their depth, breadth, and caliber of educational programs, the range of interdisciplinary degree offerings, achievements of faculty, and quality of clinical services provided.

Leadership in Dental and Craniofacial Research. UC dental schools are highly regarded internationally for the breadth of their federal, state, and privately funded dental and health sciences research activities in areas such as oral cancer, oral biology, AIDS, and biotechnology, and through collaborative programs with UC schools of pharmacy, nursing and medicine.

Dental School Curricular Reform. UC schools are revising their curricula to facilitate an evidence based, patient-centered learning environment, inclusive of diverse patient groups.

Focus on Diversity. With the goal of increasing the number of underrepresented minorities enrolled in UC’s dental schools, both programs have implemented “pipeline” initiatives to expand their community training and clinical care programs and to improve efforts to recruit disadvantaged students. They have also developed successful post-baccalaureate pre-dental programs.

Challenges for UC Dental Schools

Student and Faculty Diversity. The dental workforce includes few dentists, educators, and researchers from groups traditionally underrepresented in the health sciences and is not adequately prepared to meet the oral health needs of California’s diverse communities.

Recruiting, Training, and Inspiring Future Practitioners. The state’s budget crisis has resulted in multi-year permanent budget cuts and corresponding fee increases for health sciences students. Rising educational costs and increasing student debt threaten the University’s efforts to recruit and train a diverse group of professionals who will work in California’s many underserved communities.

Shortages of Dental School Faculty. Retirement of dental school faculty age 60 years and older alone is estimated to result in nearly 900 faculty vacancies in U.S. dental schools by the next decade. Other factors include lower salaries compared to those offered in the private sector, pressure to generate income, level of indebtedness, time required to pursue academic careers, and a diminished interest in teaching among students.

MEDICAL EDUCATION

Medical Practice and Health Care Delivery

Physicians are medical practitioners, researchers, teachers, and administrators. In these roles, they have been part of dramatic changes in the organization, financing and delivery of health services that have occurred over the last decade. New knowledge, technologies, and models of care developed that allow physicians to better respond to the changing health needs of Americans throughout their lives.

Fundamental changes are reflected in the shift from solo and small-group practices and problem-focused care to practices in a variety of clinical settings (e.g., ambulatory/outpatient, hospitalist, and “boutique”) and increasing use of integrative, interdisciplinary disease management models.

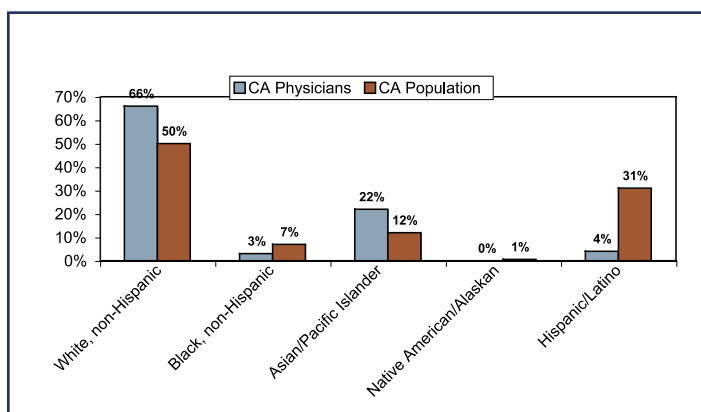
The Physician Workforce

There are approximately 780,000 professionally active physicians in the United States. In 2002, 105,000 physicians (including both those who were active and those who were retired) were licensed to practice in California.

Of the state’s active patient care physicians, 75% attended medical school outside of California. Of the 25% who attended a California medical school, 62% graduated from a UC school. Nearly 60% of California’s physicians completed their residency training in their principal specialty within the U.S.

Demographic Profile of Physicians

Of the 93,000 active patient care physicians in California, the median age is 48 (42 for women, 51 for men). Close to 70% are men aged 45 years and older. Of those younger than age 35 years, 46% are women.



The majority of California’s physicians (66%) are white, followed by Asian/Pacific Islander (22%), Hispanic (4.4%), African American (3%), and other races (3.9%). Compared with the California population, the ethnicity of the state’s physician workforce differs significantly from that of the people it serves.

Workforce Projections

State workforce studies predict that demand for physician services will continue to outpace the supply of physicians over the next 15 years. As a result, California will face a shortfall of up to 17,000 physicians by 2015.

Factors Affecting Demand for Physician Services

- Growth, aging, and increasing diversity of the California population
- Rising incidence and prevalence of chronic illnesses and comorbidities
- Need for culturally and linguistically competent physicians to serve diverse groups and communities
- Access to physician services based on practice location and patients’ insurance status
- Increasing public expectations about topics such as screening, prevention, wellness, and end-of-life and palliative care

Factors Affecting Supply of Physicians

- Aging of California’s physician workforce
- Absence of growth in educational opportunities for medical students and residents including virtually no growth in UC programs in more than 25 years
- Choice of professional activity (research, teaching, patient care) and discipline (generalist vs. specialist)
- In-migration of physicians trained outside of California and the U.S. and increasing shortages of physicians nationally

Medical Education

In the U.S., 126 accredited allopathic medical schools enroll 17,000 first-year students annually in 4-year programs leading to the M.D. (Doctor of Medicine) degree. Twenty colleges of osteopathic medicine enroll a total of 2,534 first year students in 4-year programs leading to the D.O. (Doctor of Osteopathy) degree.

Medical Students. California's 10 medical schools annually admit 1,342 first-year students and maintain a total enrollment of 5,487. UC enrolls 629 first-year students, with a total enrollment of 2,540. The majority of UC students are Californians and are non-Hispanic whites or Asian Americans. Men and women are equally represented.

State medical student enrollment figures have changed only slightly in 20 years (<6%), most of which is the result of doubling enrollment in California's two colleges of osteopathic medicine. UC schools have seen no growth in state-funded enrollment in more than 25 years. In 2002, California had 15 medical school slots per 100,000 population, significantly below the U.S. average of 27.

Because of increasing numbers of applicants and limited enrollment capacity at California's medical schools, less than 5% of all applicants to any given UC medical school ultimately enroll there. Because UC and other California medical schools cannot accommodate growing numbers of Californians applying for training, more California students seek educational opportunities out of state than are trained in state.

Residency Training. An estimated 67 institutions in California sponsor more than 700 accredited residency programs. Through some 300 specialty-specific programs, UC trains medical residents in UC-based health care facilities and a network of over 100 UC-affiliated hospitals and clinics across the state. At these sites, UC faculty and residents provide much-needed health services for California's under- and uninsured patients.

Annually, UC enrolls approximately 1,000 first-year residents in residency programs from 3 to 7 years in duration. On average, about half of UC residents are enrolled in primary care training programs. The majority of residents are white (61%) or Asian/Pacific Islander (25%). A disproportionately low number are Hispanic, African American, or Native American. In surgical specialties and medical and surgical subspecialties, the majority of residents are men; primary care specialties enroll higher numbers of women.

Upon completion of residency training, an estimated 70% of UC residents remain in California to practice. In-state retention rates are affected by specialty, job availability, cost of living, and plans for further professional training.

Strengths of UC Medical Schools

Excellence and Innovation in Education. Using an updated, integrative, problem-based curriculum, UC's nationally recognized faculty enable UC schools to provide a full range of high-caliber advanced degree programs and interdisciplinary research opportunities in such fields as AIDS, cancer, and aging.

Leadership in Research and Development. UC leads the nation in NIH grant funding for medical and bioscience research. Advances in understanding and treating diseases and development of new technologies and industries have helped UC researchers gain worldwide recognition.

Comprehensive Training and Clinical Care. UC's medical centers, hospitals, and clinics, principal training sites for two thirds of California's medical students and half of its medical residents, represent the fifth largest health care delivery system and second largest Medi-Cal provider in California.

Outreach to Diverse Communities. Committed to providing medical education to diverse populations of students, UC offers a wide variety of outreach, enrichment, mentoring, and post-baccalaureate programs. New educational initiatives with specialized curricula are designed to attract students interested in practicing in underserved communities.

Challenges for UC Medical Schools

Limited Educational Opportunities. Absence of growth in medical student and resident enrollments limits UC's ability to respond to growing educational demand and increasing societal demand for physician services.

Balancing Budget Cuts. Reduced state support for instruction (25% in 2004-2005 alone) results in rising student fees and increasing student indebtedness, greater demands for faculty productivity in clinical settings, and increasing reliance on volunteer faculty to fill teaching roles in expanding clinical settings.

Incorporating New Models of Teaching. Small-group, case-based instruction; expanded curricula; and new technologies require new uses of old facilities and place demands on faculty to respond to new educational paradigms while meeting increasing expectations for clinical productivity.

Recruiting and Retaining Faculty. Higher salaries offered by other employers; increasing demands to teach, conduct research, and practice; and California's high cost of living pose increasing challenges in recruiting and retaining health science faculty.

Increasing Student and Faculty Diversity. Rising student fees, California's high cost of living, small applicant pools, and competition from other U.S. medical schools hinder UC's efforts to attract students and faculty traditionally underrepresented in the health sciences.

NURSING EDUCATION

Nursing Licensure and Practice

“Licensed nurses constitute the single largest occupation in the healthcare industry. The majority of licensed nurses work in hospitals; others work in homes, schools, clinics, physicians’ offices, long-term care facilities, and public health agencies. Nurses play a critical role in the provision of health care because their scope of practice places them in direct contact with patients in most health care environments. Patients rely on licensed nurses to assess, treat, and monitor their diseases and conditions, and to educate them about maintaining health and managing chronic illness.”

- UCSF January 2004

Registered nurses (RNs) take their licensure exam after completing a diploma nursing program, an associate degree, or a baccalaureate degree. Ten percent of the 2.7 million registered nurses in the United States hold masters and/or doctoral degrees. Graduate degrees prepare nurses to be nurse educators, administrators, researchers, or clinicians in advanced practice. Advanced practice nurses become certified as nurse practitioners, anesthetists, midwives and clinical nurse specialists, often caring for underserved and disadvantaged populations.

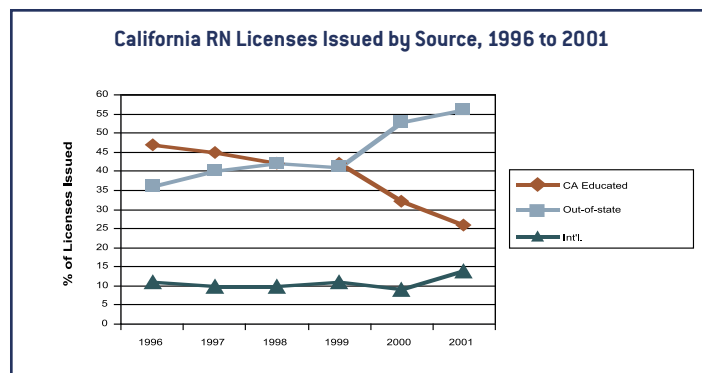
Nursing Workforce and Projections

The most recent national statistics show California to be 49th among the states in nurses per capita: in 2000, California had 542 nurses per 100,000 population, versus the U.S. average of 780 per 100,000. State statistics indicate that 293,493 registered nurses are currently in active practice, and – despite steady growth of the RN population since the early 1990’s - studies predict California will need over 60,000 additional nurses to meet demand in 2020.

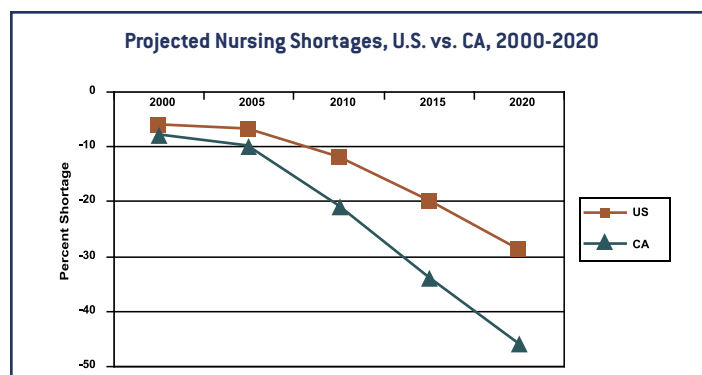
California’s 100 nursing programs educate approximately half of the RNs needed to meet the state’s demand. In recent years, the proportion of newly-licensed nurses in California who were educated out-of-state has been increasing. The percent of new licenses issued to internationally educated nurses has increased in response to the current nursing shortage.

Demographic Profile of Nurses

93 percent of California’s nurses are women (slightly lower than the national average of 95 percent); 75 percent are white; 11 percent are Asian; 4 percent are African American, and another 3.6 percent are Hispanic – a racial and ethnic demographic profile which differs greatly



Source: California Board of Registered Nursing



Source: U.S. Bureau of Health Professions

from the state’s population overall. Less than 25 percent of California’s RNs are under 40 years of age, and 13 percent are older than 60. A wave of retirements is anticipated over the next decade, which will further increase the nursing shortage in the state.

Factors Affecting Demand

- Overall population growth and increased proportion of persons over age 65, many with chronic illnesses
- New nurse staffing ratios proposed for CA hospitals
- Geographic maldistribution
- New national accreditation standards limiting the number of hours medical residents can work

Factors Affecting Supply

- Aging of the nursing workforce
- Faculty shortages limiting enrollment growth and the number of qualified applicants who can be accepted into California nursing programs
- Enrollment caps related to budget concerns

- Minimal federal funding for RN education
- Reliance on diminishing in-migration
- Multiple paths to RN certification
- No opportunity for undergraduate nursing preparation within the UC system

Nursing Education

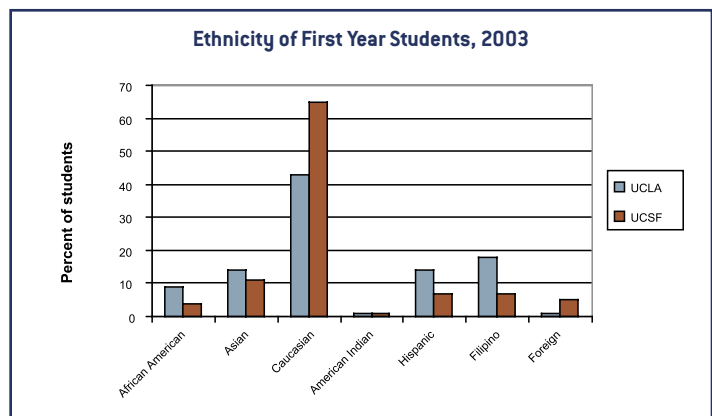
RN educational programs are categorized as either pre-licensure or post-licensure. California has 100 pre-licensure programs, 23 of which offer the baccalaureate of science in nursing (BSN), and five that offer an entry-level master’s (ELM) degree where students who already have a bachelors degree can meet the requirements to take the RN examination and earn a master of science degree in 3 to 4 years. 15 entry-level RN programs are offered by private colleges; the overwhelming majority of others are offered by community colleges, the California State University system, and the UC system. Publicly-funded institutions educate 86% of the state’s RN graduates. Each program has its own prerequisites, graduation requirements and curricula, although the community college nursing programs are currently attempting to standardize prerequisites.

In the 2001-2002 academic year, 14,260 students were enrolled in pre-licensure programs [63% in Associate Degree programs; 34% in BSN programs; and 3% in entry-level masters programs]. Roughly 5000 of these will be expected to graduate each year. The number of students enrolled in RN programs has remained relatively steady over the past ten years, but did begin to increase slightly beginning in 1999. Enrollment growth is limited by a major statewide shortage of nursing faculty, enrollment caps, and budget concerns regarding the costs of developing new programs. Approximately 26% of RNs in California receive additional educational degrees after completing their primary nursing education.

UC’s two schools of nursing offer pre- and post-licensure RN education [UCSF offers pre- and post-; UCLA offers post- only]. Both are ranked among the nation’s top nursing schools.

	UCLA	UCSF
Students	315	598
State-Funded Faculty	39.8	75.42
Extramural funding	\$26.6 million	\$33.4 million (top ten nursing school in NIH funding)
Other strengths	US News ranking “Top Ten in the U.S.”	US News ranking top two in U.S.

Although more diverse than other health professions, the ethnicity of UC nursing students does not reflect the ethnicity of California’s population.



Strengths of UC Nursing Schools

Excellence in Training. The UC nursing schools play a central role in preparing future faculty for California nursing programs as well as advanced practice nurses.

Excellence in Research. UC nursing faculty generate important translational research in the areas of disease prevention and symptom management. In 2003-04, UCSF was ranked as the top U.S. nursing school and received the highest amount of NIH funding among all schools of nursing in the U.S..

Excellence in Clinical Practice. UC schools own/manage nurse-managed clinical practices designed to bring care to the medically underserved and homeless.

Challenges for UC Nursing Schools

Absence of an undergraduate (B.S.N.) nursing program.

Limited enrollment capacity.

Recruiting of educationally and financially disadvantaged students.

Lack of scholarship support for students.

Lack of financial support for necessary program growth in critically needed areas (e.g. vulnerable populations, genomics, gerontology, informatics).

Difficulty recruiting and retaining faculty. Both Los Angeles and San Francisco have high costs of living and compare unfavorably to other U.S. cities where UC faculty are heavily recruited.

OPTOMETRY EDUCATION

Optometry Infrastructure

Optometrists provide an estimated 70% of eye care for Americans, and serve as the “primary care” providers of vision care nationwide, providing diagnosis, prevention, and treatment of vision diseases and disorders to millions of Americans.

Optometrists are independent primary health care providers who examine, diagnose, treat, and manage diseases and disorders of the visual system, the eye and associated structures as well as diagnose related systemic conditions. Optometrists examine the internal and external structures of the eye, to diagnose diseases such as glaucoma, cataracts and retinal disorders; systemic diseases including hypertension and diabetes; and vision conditions like nearsightedness, farsightedness, astigmatism and presbyopia. They prescribe vision aids, vision therapy and medicines to treat eye diseases.

Doctors of Optometry (ODs) work independently as well as with surgical and non-surgical subspecialists to deliver eye care to patients of all ages.

Optometry Workforce and Projections

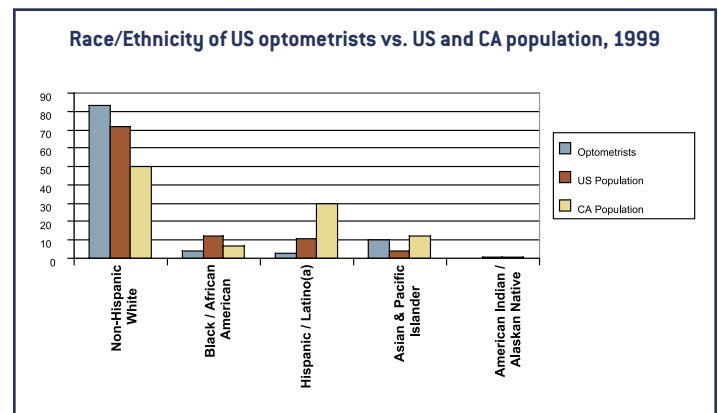
More than 31,000 optometrists practice in the U.S. Of these, approximately 4,000 practice in California. Two-thirds of optometrists are in private practice, working either as solo practitioners or in partnership with other optometrists, ophthalmologists, or other health professionals. The remainder practice in a variety of settings, including hospitals, clinics, and community health centers; health maintenance organizations; commercial settings such as those affiliated with retail optical stores; military, public health, or other governmental facilities; industry (e.g., industrial safety programs, insurance companies, and contact lens and ophthalmic product manufacturers), and academic institutions. Some optometrists specialize in areas such as primary care optometry, family practice, infant/toddler/child care, elder care, low vision, sports vision, contact lenses, vision therapy, or vision in the workplace.

California currently exceeds the national average of optometrists per capita, ranking 9th among states, with 11.1 optometrists per 100,000 population by contrast to the U.S. average of 8.7 optometrists per 100,000 population. As in most health professions, there are challenges involving geographic distribution of optometrists, with insufficient numbers practicing in rural and urban underserved areas across the state.

Projections made by the U.S. Department of Labor indicate that employment of optometrists will grow by 10 to 20% between 2002 and 2012, or “as fast as the average for all occupations,” and that workforce needs will vary by census region. Pediatric and geriatric optometry are predicted to be the specialty areas of greatest need. Geographically, rural areas will continue to need more optometrists than urban areas, reflecting general trends involving shortages of health professionals.

Demographic Profile of Optometrists

As is the case in other health professions, the ethnicity of the optometry workforce does not reflect that of the state or U.S. population.



Factors Affecting Demand and Supply

- Increased patient volume, due to the aging population, increased computer use, and underlying need for preventive services
- Wider scope of practice and greater market share within managed care
- Expanded vision insurance coverage
- Increased need for teaching and research faculty nationwide
- Increasing rates of entry into practice
- Increased use of allied professionals
- Increased development and use of new technologies, including laser vision surgery

Optometry Education

There are 17 accredited schools and colleges of optometry in the U.S. and Puerto Rico. They offer three degrees, the most common of which is the Doctor of Optometry (OD). Two schools offer optometry education in California: the University of California Berkeley School of Optometry (UCB) and the (private) Southern California College of Optometry. Beyond training MS and PhD students, UCB trains approximately 15 postdoctoral fellows and an average of four residents each year.

Approximately 69% of UCB applicants – and 80% of first year students - are California residents. The majority of applications come from graduates of UC schools, most often the Berkeley, Davis, Irvine, Los Angeles, and San Diego campuses.

Nationwide, approximately 15 to 20% of new optometrists choose to complete a residency, which is typically a year-long program. Residency training at UCB is an important element of the school's teaching, research, and clinical service programs. Each UCB resident specializes in one of six clinical “tracks” – primary care, pediatrics, cornea/contact lenses, low vision/geriatric care, binocular vision, or ocular disease. Following residency training, most UCB graduates seek part-time or full-time teaching positions. As faculty shortages materialize at many U.S. optometry schools, ODs with specialized residency training will be in high demand to fill clinical faculty vacancies.

UCB's highly competitive residency program attracts an average of 4.5 applicants for each position compared to a national average of 1.2 applicants per slot.

Strengths of UC Optometry Schools

Top students and educational opportunities. The average scores of UCB students on the Optometric Admissions Test (OAT) are consistently among the highest of all programs in the nation. For many years, close to 100% of graduates pass licensure examinations. UCB is also recognized for innovation in education. Students gain in-depth clinical experience in both the school's state-of-the-art eye center and during their three required 10-week rotations at various externship sites. Students also participate in research activities through the school's Lions International Club Foundation Clinical Research Center.

Research productivity and research funding. UCB leads the nation in research grants from the National Eye Institute/National Institutes of Health, ranking first among optometry schools, and first for all optometry and ophthalmology departments in the UC system for both the number of

faculty that receive NIH funding and the research dollars awarded. Since 2000, the school has received \$52 million in NIH support.

Preparation of future faculty. UCB graduates are a major resource for academic optometry programs nationwide. Faculty at all but two of the nation's schools of optometry include one or more UCB graduates. A small number serve as faculty at optometry schools overseas or teach in related fields such as ophthalmology or other sciences. At least 64 of UCB's current faculty, in both clinical and basic sciences, are graduates of the school.

Challenges for UC Optometry Schools

Supporting residency training. UCB's residency programs attract many of the best and brightest new graduates in the field. Residency training is a vital part of UCB's teaching and clinical mission, but the fact that the program lacks state support for salary and benefits for its residents and is limited to only four or five residents per year keeps the school from benefiting from many teaching and clinical care activities that a larger program would allow. These include expanded patient care services and increased preparation of specialists and new faculty.

Diversifying the student and faculty bodies. Since 1995, the ethnicity of the UCB student body has been predominantly Asian (average of 55%). The next largest ethnic group has been white (34%), followed by “foreign nationals,” “other,” Hispanic Americans, and African Americans. Among the faculty, the largest ethnic group is white (n = 51, or 67%), followed by Asian/Pacific Islander (n = 19, or 25%). The numbers of faculty who are Middle Eastern, Hispanic American, and African American are much smaller (n = 3, 2 and 1, respectively). Although the lack of diversity in the health professions is longstanding and national in scope, this profile clearly does not reflect the state's overall ethnic diversity.

Recruiting and retaining faculty. Although faculty recruitment has not yet been a challenge for UCB, a nationwide shortage of optometry faculty is predicted. As shortages develop – and as costs of living increase and UC salaries lag behind those of comparison institutions – faculty recruitment and retention will become greater challenges. Increasing demands on faculty time for teaching and patient care, together with the fact that funding formulas have not kept pace with increasing basic science and clinical teaching requirements, add further challenges for the school.

PHARMACY EDUCATION

The Practice of Pharmacy

Licensed pharmacists play active roles in the health care system and in the biotechnology and pharmaceutical industries. In hospitals, clinics, and community retail pharmacies, Doctors of Pharmacy (PharmDs) dispense medication prescribed by doctors and dentists, participate actively in drug monitoring and disease management, and advise patients and prescribers about potential drug/drug and drug/disease interactions and changes in the management of chronic and acute illnesses. As researchers, PharmDs enhance drug discovery and development, develop therapeutic formularies to improve outcomes, and evaluate drug efficacy by conducting clinical trials.

The Pharmacy Workforce

Pharmacists represent the third largest health professional group in the nation. In 2000, there were 196,000 working pharmacists in the U.S., which corresponds to a national average of 65.9 pharmacists per 100,000 population. The Health Resources and Services Administration (HRSA) predicts the total number of pharmacists will increase by 28,500 (14%) to meet growing demand for services in all sectors.

In 1998, 16,770 pharmacists served 32 million Californians, which corresponds to a ratio of 51.3 pharmacists to 100,000 population. With this ratio, California ranks 48th among all states in the nation. Critical pharmacy workforce shortages in the state are expected to continue. According to the Aggregate Demand Index-Pharmacy Manpower Project, California is one of five states with the greatest unmet demand (highest number of unfilled positions) for licensed pharmacists.

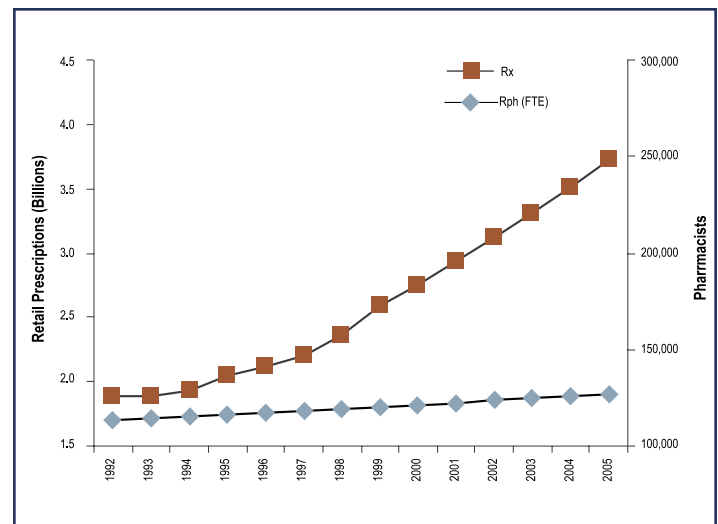
Demographic Profile of Pharmacists

Nationwide and in California, the majority of pharmacists are men in their mid-40s. Although women represent less than half of all California pharmacists, the majority of the state's enrolled pharmacy students and recent pharmacy graduates are women.

The ethnic profile of California's pharmacy workforce differs from that of the state's residents. Whereas the majority of Californians are white (47%) followed by Hispanic/Latino (32%), the majority of pharmacy graduates in 2002 were Asian-Pacific Islander (63%) and non-Hispanic white (26%).

Factors Affecting Demand for Pharmacy Services

- Growth and aging of California's population
- Widening scope of pharmacy practice in clinical and research settings
- Expanding career opportunities in biotechnology and pharmaceutical industries
- Growing need for culturally and linguistically competent pharmacists to serve California's diverse communities
- Steady and dramatic increases in prescriptions written and dispensed



Factors Affecting Supply of Pharmacy Services

- Revised educational requirements and standards for pharmacy licensure
- Historic requirement of a California-specific pharmacist licensure examination
- Limited educational opportunities for pharmacy students and residents
- Expanding career options for licensed pharmacists (e.g., practice vs. research)
- Changing work habits and interests by some professionals in working fewer hours and retiring at earlier ages
- Growing availability of pharmacy technicians to work in a variety of new settings

Pharmacy Education

Currently, 87 accredited schools of pharmacy in the US enroll approximately 42,000 students in a 4-year program leading to the PharmD degree. Of these, 66 also offer other graduate programs in the pharmaceutical sciences, enrolling close to 480 master’s and 385 PhD degree candidates. From 2002 to 2003, total enrollment in first-professional degree programs in US pharmacy schools increased by 10.7%.

The number of applications for admission to PharmD programs at U.S. schools of pharmacy rose rapidly between 2000 and 2003: a 9.1% increase between 2000 and 2001, a 24.6% increase in 2002, and a 41.7% increase in 2003. In 2002-2003, the submission of more than 47,000 applications to all US schools is equivalent to 4.8 applications for each entering student.

The majority of applicants in 2003 were white (48%) or Asian/Pacific Islander (28%); women represent 65% of the applicant pool .

Reflecting national trends, the number of applicants to California’s six PharmD programs continues to rise steadily. Each year, the number of qualified applicants exceeds the number of available first-year positions.

Applicants to California PharmD Programs in 2003 and 2004

	Loma Linda	UCSF	UCSD	USC	Western Univ	U of Pacific
Positions	55	122	30	185	120	200
Apps 2003	235	854	496	737	647	1277
Apps 2004	475	1236	1071	1300	1053	1875

Total enrollment in California’s PharmD programs is approximately 2,400 students. With plans to increase enrollment at Loma Linda University and the UCSD campus, and to maintain current enrollment at other schools, California will add approximately 4,500 new graduates to the pharmacy workforce by 2010. Despite this gain, the total number of pharmacists in California still falls short of the national average and of projected need based on population growth and health care utilization trends.

In both UC schools, the majority of PharmD enrollees are women. The percentage of all enrolled students from underrepresented minority groups in California (including African American, American Indian/Alaskan Native, and Mexican Americans) is less than 10% (43 of 477) at UCSF and less than 4% (2 of 51) at UCSD.

Strengths of UC Pharmacy Schools

Comprehensive Interdisciplinary Curriculum.

In response to scientific advances and expanding professional standards, UC pharmacy schools have increased academic and degree offerings in interdisciplinary fields and developed new areas of study to address changes in pharmacy practice.

Preparation of Pharmacy Faculty. UC’s advanced-level training – including residency and fellowship programs – are critical for ensuring an adequate supply of future pharmacy faculty in California and nationally.

Advanced-Level Clinical Training. Completion of residency training is required for inpatient pharmacy practice and leadership positions in academic health centers. Only UC and USC offer residency and fellowship programs in California that prepare pharmacists to fill these critical workforce roles.

Equipping Future Leaders in Research and Industry. With its broad-based pharmacy curriculum, advanced degree programs, and proximity to the state’s growing pharmaceutical and biotechnology sectors, UC prepares both clinical pharmacists and pharmaceutical scientists and researchers.

Challenges for UC Pharmacy Schools

Required Resources for PharmD Training. Levels of funding for PharmD education and residency/fellowship training, unchanged since 1970, neither adequately support a dramatically changed educational paradigm nor recognize broadened professional training and licensure requirements. Combined with the inability to cross-subsidize, limited resources prevent UC from increasing pharmacy educational opportunities.

Limited Advanced Level Training Positions. The numbers of residency and fellowship opportunities are not adequate to meet employment needs or to accommodate the growing pool of qualified applicants.

Recruiting and Retaining Faculty. The small pool from which to draw new faculty, higher salaries in the private sector, California’s high cost of living, increasing academic demands, and insufficient resources to support quality teaching and research programs makes successful recruitment and retention difficult.

PUBLIC HEALTH EDUCATION

Public Health Infrastructure

Public health has been defined as the science and art of promoting health, preventing disease, prolonging life, and improving quality of life for the general population. The success of the U.S. public health system depends on well-trained public health professionals that come from a variety of disciplines, work in a variety of settings, and engage in a variety of activities. The principal areas of focus of the public health system are health surveillance, protection, and promotion; policy development and regulation; and the organization, delivery, and evaluation of health services delivered to individuals and populations.

Public Health Workforce

The public health workforce includes clinicians (physicians, nurses, dentists); occupational and environmental health specialists; epidemiologists and biostatisticians; health program administrators and health educators; and health economists, planners, and policy analysts. Public health professionals are specifically defined as individuals holding advanced degrees in public health or a related field. Much of the workforce, however, has no formal public health training. Overall, the public health workforce is said to include workers in:

- Governmental public health agencies (federal, state, county and local health departments)
- Non-governmental public health organizations (community-based social service organizations and advocacy groups)
- Health care financing and delivery systems (hospitals, health plans, and medical groups)
- Academic and research institutions
- Private organizations (disease management, information technology, and biotechnology firms)

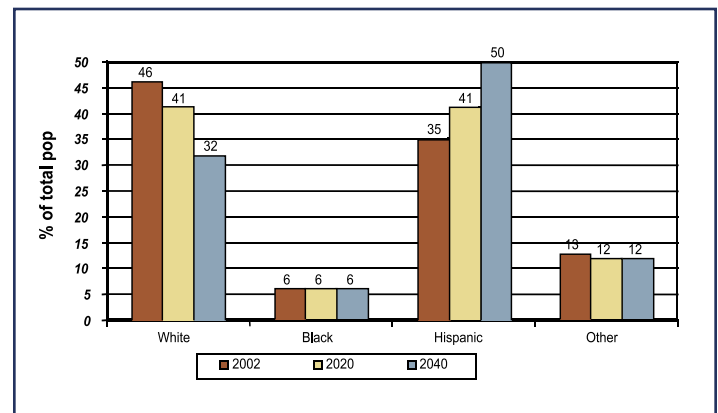
Workforce Estimates and Needs

Estimating the size, demographics, and competencies of the public health workforce is complicated by limited data accounting for all workforce sectors and lack of a verifiable number or formula defining an adequate public health workforce. Frequently cited estimates put the national public health workforce at nearly 450,000 paid, full-time workers, with an estimated 45% employed in governmental settings.

Nationwide, the greatest demand among professional occupations is for public health nurses, environmental scientists, health educators, epidemiologists, and administrators. In California, particularly in rural counties, the greatest staffing need is for clinicians, microbiologists, program administrators, and dieticians, with or without formal public health training. When public health degrees are required, shortages exist for epidemiologists, health educators, and environmental health scientists.

Factors Affecting Demand

- New diseases and public health challenges
- Widened scope of professional activities to include biological, environmental, and social and behavioral factors
- Growth and aging of the overall population
- Increasing diversity of California's population



Ethnicity in California to 2040 (CA Dept. of Finance)

Factors Affecting Supply

- Aging of the public health workforce in California and nationally
- Educational opportunities to accommodate growing numbers of prospective public health professionals
- Shortages of professionals in other health disciplines
- Lack of formal training of existing public health workforce
- Choice of professional activity (governmental vs. non-governmental agency or organization)

Public Health Education

Nationwide, 36 accredited schools of public health at 10 private and 26 public universities offer master's (MPH), doctoral (DrPH, ScD) degrees, and joint degree (MPH with MD, MSW, MBA, JD, etc.) programs. The MPH is the most common professional degree. In 2003, student enrollment totaled 19,000 nationwide, an increase of 6% from 2002 and of 31% since 1993. Most students are white women. Enrollment of underrepresented minority students increased by 8%, however, from 2002 to 2003.

The number of applications for admission to public health schools has risen steadily over the last decade (48% since 1992). Principal areas of interest are epidemiology, health services administration, health education/behavior science, international health, and biostatistics.

Applications to California's four schools and six accredited programs in public health show similar upward trends. Where UC schools of public health differ from the national statistics, however, is the virtual lack of growth in enrollment over the last 10 years. Limits to growth include the number of faculty FTE and space constraints. In 2002, UC schools, among the most selective in the country, enrolled 462 students in 2002 from a combined pool of 1838 applicants. The majority of applicants and enrollees were women; 9.5% of students at UCB and 18.5% of UCLA students were from underrepresented minority groups.

Among the nation's top ten schools of public health, UCB is the smallest and UCLA is the third smallest in total enrollment. In California, however, they are the largest, training more than 65% of masters' and 80% of doctoral candidates enrolled in schools and programs of public health in the state.

Students	UC Berkeley	UCLA	Loma Linda	SDSU
Total	474	709*	306	336
Masters'	319	460	246	304
Doctoral	155	249	60	32

Accredited public health programs at USC and five California State University campuses offer MPH degrees with most focusing on environmental and occupational health, health administration, and community health education and promotion. New advanced degree programs within the UC Davis Schools of Medicine and Veterinary Medicine and also at UC Irvine within the School of Social Ecology will increase opportunities for interdisciplinary training within the public health field.

Strengths of UC Schools of Public Health

Interdisciplinary Learning and Research. The research and teaching strength of UC faculty are well recognized. Opportunities for collaborative research and learning across disciplines, and joint degree offerings with medicine, business, public policy, law, social welfare, and social studies, yield graduates who are well equipped to enter and contribute significantly to a variety of workplace settings.

Preparing and Training Future Leaders. Graduates of UC programs consistently are recruited to assume leadership positions in governmental agencies, nongovernmental organizations, health care delivery systems, and academic institutions across the nation.

Innovation in Education. UC has responded to the need for expanded education and training opportunities for the current and future public health workforce by developing an executive MPH program, minor and major courses of study in public health for undergraduate students, and "pipeline" programs to promote undergraduate student interest in the field.

Interaction Between Academia and Practice. Through training centers and course offerings, UC students have opportunities to gain valuable work experience in local, state, and national agencies; performing community health assessments; and participating in activities to increase public health awareness and meet community health needs.

Challenges for UC Schools of Public Health

Meeting Growing Demand for Training. Located in densely populated urban areas, UC schools face major constraints with regard to classroom, office, and laboratory space.

Diversifying the Public Health Workforce. At UC, and across the nation, the number of minority faculty and students is low relative to the population future professionals will serve. Increasing diversity and improving cultural competency are identified by future employers as priority objectives.

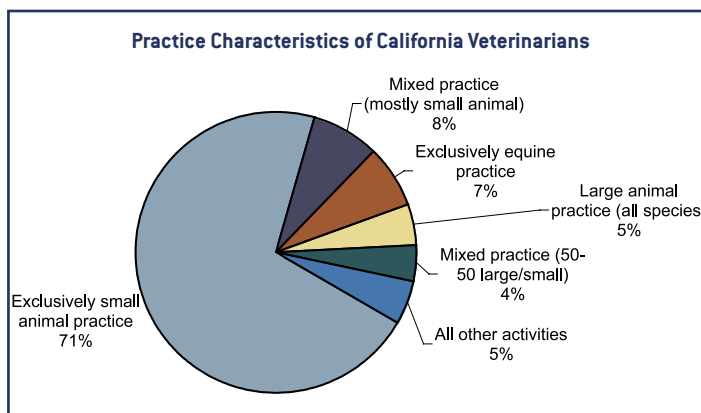
Assessing Responses to Workforce Needs. Better systems to collect and analyze graduate and workforce data are needed to guide future educational planning so UC can effectively respond to the needs of California's public health system.

VETERINARY MEDICAL EDUCATION

Veterinary Health Infrastructure

The veterinary health system includes teams of veterinarians, veterinary technicians, veterinary assistants, adoption and grief counselors, kennel workers, and volunteers. Their efforts focus on protecting the health and welfare of animals and people.

Approximately 75% of all U.S. veterinarians work in private practices. Of those, about 58% are engaged exclusively in small animal practice; nearly 18% limit their practice to the care of farm animals or horses. Another 19% of veterinarians work in mixed animal practices that provide care to all types of pets, horses, and livestock. Approximately 94% of the members of the California Veterinary Medical Association (CVMA) are engaged in private practice.



Veterinary Workforce and Projections

There are 76,291 professionally active veterinarians in the U.S. and approximately 5,860 working in California. The national average veterinarian-to-population ratio is currently 27 veterinarians per 100,000 population. By contrast, the average ratio in California is 17:100,000. Twenty counties in California, almost half, are at or below this level. Currently the UC Davis School of Veterinary Medicine graduates 122 new veterinarians each year. Since 1995, an average of approximately 230 veterinarians trained outside of the state are licensed each year to practice in California. If the state were to meet the current national average, an additional 3,367 California veterinarians would be needed.

Relative growth in the number of California veterinarians (about 1% per annum) ranks the state 49th in the nation as evidenced by significant regional shortages identified in some areas of the state. Since only 27 states in the U.S. offer veterinary education to fulfill the veterinary

healthcare needs of the nation, their responsibility extends beyond state and regional boundaries. To address the need for veterinarians to meet national demand, and acknowledging an estimated retirement rate of 2.8% per year, an additional 725 new veterinarians in California would be needed each year.

Demographic Profile of Veterinarians

The average age of a practicing veterinarian in the U.S. is 45 years (49 for men; 40 for women). Since the mid-1970's, the number of women accepted to veterinary schools has steadily increased. By 2005-2006, the number of practicing women veterinarians in the profession is expected to outnumber men.

The veterinary workforce is among the least diverse of the health professions. Efforts within the profession and veterinary schools to increase diversity have produced modest results, but at a slower pace than desired. Approximately 90% of students enrolled in veterinary colleges are white. Only 3% are Asian, 3% are Latino, and 2% are African American.

Factors Affecting Demand for Veterinary Services

- Growth of the California population
- Growth in the total number of pets per household
- Increased demand for veterinary livestock services to ensure agricultural and food safety
- Increased demand for security against emerging diseases and bioterrorism/agroterrorism
- Greater demand for more sophisticated diagnoses and treatments

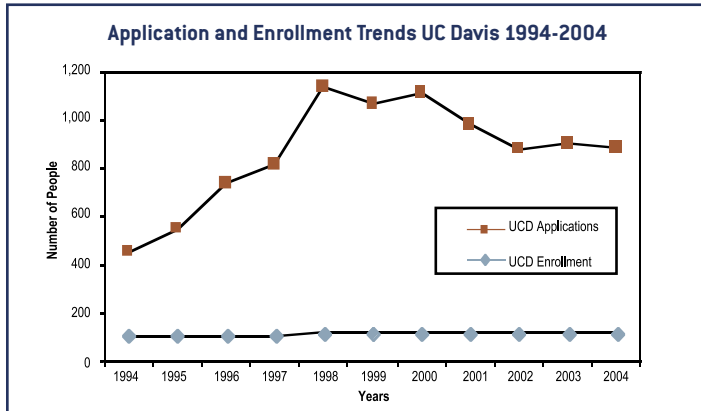
Factors Affecting Supply of Veterinarians

- Downward shifts in productivity due in part to desired lifestyle changes (e.g., voluntary reduction in work hours)
- Aging of the veterinary workforce
- Faculty shortages
- Limited educational opportunities available in veterinary medicine

Veterinary Medical Education

Currently, 28 accredited schools of veterinary medicine in the U.S. enroll approximately 9,600 Doctor of Veterinary Medicine (DVM) students across a four-year curricular period. Approximately 2,400 of these students graduate each year.

Two veterinary medical schools in California, the University of California Davis (UCD) and the Western University of Health Sciences (WUHS), enroll approximately 570 DVM students annually. The number of applications consistently exceeds the capacity of California's training programs.



Enrollment Capacity of California Schools

The UCD School of Veterinary Medicine (SVM) received a permanent annual budget augmentation of \$2.5 million, beginning in fiscal year 1998-1999, which was used to fund a modest level of enrollment expansion. This expansion was to be phased in over the last several years. As planned, this augmentation was used to support:

- an increase in the enrollment of DVM students by a total of 23 students per class per year, to a total class size of 131 students per year;
- an increase in the enrollment of DVM specialty residents by an additional 30 trainees, for a total resident enrollment of 90 trainees across all years of training; and
- administrative and technical needs to establish a veterinary presence in southern California.

When this expansion is achieved and the DVM programs are fully enrolled, student fees will have increased, facilities will be in place and new faculty members will have been recruited to accommodate a larger class size in the fall of 2006.

At full operation, the WUHS proposed a class size of approximately 90 students per year. The school admitted its Charter class of 85 students in the fall of 2003.

Strengths of the UC School of Veterinary Medicine

Leadership in Veterinary Research. UC SVM has the largest graduate academic program among all of the veterinary schools and colleges

nationwide and consistently ranks as one of the top two U.S. veterinary schools in training future faculty.

Animal Health and Care. As the primary animal health resource for the state, the school's responsibilities to protect animal health and improve animal care are paramount.

Food Safety and Public Health. The SVM is the main source of information and health services for animals in production units, the inspectors in processing plants, and the public health officials for inspection of food preparation operations in California.

Development of Advanced Clinical Specialists. UCD has led the development of emerging specialty disciplines and continues to work at the cutting edge to recognize the need, develop the discipline, define the standard, and train the specialists.

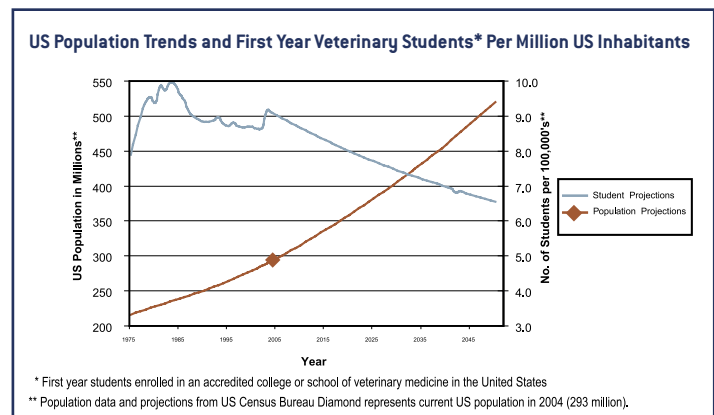
Challenges of the UC School of Veterinary Medicine

Demand for Veterinary Service is increasing. California's current supply of veterinarians is only 63% of the national average, which underscores the need to increase the supply of veterinarians.

Demand for Specialty Services is Increasing. In California, only 15% of veterinarians are trained as specialists, despite growing demand for services.

Recruitment of Faculty and Researchers is Difficult. The veterinary profession is growing into new areas and disciplines at a rapid rate; at the same time a significant proportion (an estimated 38%) of the veterinary faculty nationwide is expected to retire within the next 10 years.

Access to Veterinary Education in California is Severely Limited



FINDINGS

California Health Workforce Needs

1. California's population is growing, aging and increasingly diverse.

The California population – already the largest of any state in the country – will grow at close to twice the national average by 2025, and its elderly population will grow at more than twice the rate of the total population within the same time frame. By 2015, over half of all California residents (50.6%) will be of Hispanic or Asian descent. To meet the needs of the state, changes in the size, distribution, and preparation of its health workforce are required.

2. Statewide shortages of health providers exist in several major health professions; looming shortages exist in others; and current regional shortages of health providers will become more serious without effective intervention.

Research on the state and national health care workforce often focuses on the total supply of professionals, rather than on the adequacy of their distribution. Recent studies, however, show that although the total number of providers in some professions is adequate, there is a geographic maldistribution of health professionals that poses a major barrier to health access for individuals and communities throughout the state. Many of California's rural and inner-city areas have long-standing shortages of health professionals, with minority and low-income urban areas recognized as disproportionately underserved. As new statewide shortages emerge, areas already designated as health professional shortage areas will face even greater needs.

3. The demand for culturally and linguistically competent providers is growing.

Disparities in health status and the increased ethnic diversity of the population require providers to develop improved cultural and linguistic competence in order to effectively and efficiently deliver high quality health services. Underrepresented minority groups are disproportionately affected by widening disparities in health status. To improve health outcomes, health professionals must be trained to understand the biologic, social, behavioral, and cultural causes of illness and health disparities, and to communicate effectively with patients from a variety of diverse backgrounds.

4. The health workforce does not reflect the ethnic diversity of the state.

California is home to the largest and most diverse population in the nation, yet this diversity is not reflected in its health professions workforce.

Latinos, African Americans, and Native Americans are significantly underrepresented among students, faculty and clinically active providers in the state. Improving the diversity of the health workforce is an important strategy for improving health outcomes across the state.

California Workforce Findings for Seven Major Health Professions

The findings outlined in this section are intended to inform decision-making and enrollment planning for the seven major health professions programs in which UC offers training. It is important to note, however, that allied health professionals in a wide range of other fields are also essential for meeting California's needs. Although beyond the scope of this review, the HSC recognizes that analysis of changing needs for other health professionals will help inform decision-making for programs and institutions offering training in those fields. Within this context, the following profession-specific findings are listed with consideration to both the urgency of state needs and the University's role in meeting them.

5. California will face a shortage of physicians by 2015.

As a result of rapid population growth, aging of the physician workforce, and lack of growth in medical education programs in California, the state will face a shortfall of up to 17,000 physicians (equivalent to a 15.9% shortage) by the year 2015. UC medical schools train two-thirds of all California medical students enrolled in programs leading to the MD degree and nearly half of all California medical residents pursuing specialty-specific clinical training. The absence of medical school enrollment growth for more than 25 years has limited the University's ability to respond to changing workforce needs and to accommodate the growing number of qualified students who must leave the state each year to attend medical school. Although California imports more than half of its physician workforce from other states and countries, projected national shortages of U.S. physicians within a decade underscore the need for new California strategies, including growth in UC programs.

6. California's nursing workforce crisis is serious and growing.

The growth and aging of the California population and increased prevalence of chronic disease are among the factors driving California's unprecedented need for new nurses. The state currently ranks 49th in the nation in the number of nurses per capita and predictions indicate a shortfall of 60,000 RNs by 2020. The demand for baccalaureate-prepared nurses is particularly high in all health care sectors, yet UC offers no pre-licensure undergraduate nursing program. Enrollment in

the baccalaureate program at UCLA's School of Nursing was suspended in the early 1990s due to budget cuts, and UCLA now offers a Bachelor of Science (BSN) degree as part of the Master of Science in Nursing (MSN) completion program for RNs with an Associate (AA) degree. Insufficient capacity in the state's nursing educational system and insufficient faculty to support recommended enrollment increases, pose major barriers to responding to the deepening shortage. New nurse staffing ratios in California hospitals, if implemented, will result in still greater demand. UC's role in preparing graduate nurses and future faculty is critically important for responding to the need for new faculty across the state, including that of California State University campuses and private institutions offering baccalaureate nursing programs.

7. The public health workforce is seriously deficient in training, preparation, and size.

It is estimated that only 20% of the state's public health workforce has received formal training in public health. Recent studies have highlighted the threat that this poses as the Centers for Disease Control (CDC) work to increase the nation's bioterrorism preparedness, and as ongoing diseases (e.g., tuberculosis and HIV/AIDS) require continued public health efforts. California's public health agencies cite particular shortages of epidemiologists, environmental health scientists, and health educators. The private sector needs professionals trained in health services administration and management. Public health expertise has broadened to include cultural competence, genomics, informatics, and other skills; however, many public health workers lack formal training or advanced degrees in these and other specialized areas. UC's two Schools of Public Health, widely recognized for excellence in teaching and research, are an essential resource for strengthening the public health infrastructure in California and across the nation. Enrollment growth has not kept pace with increasing workforce demands, however, which limits UC's ability to respond to growing societal and professional needs.

8. California's demand for pharmacists will continue to far outpace its supply.

California presently ranks 48th in the nation in the number of pharmacists per capita. Rapid growth in the number of prescriptions written and dispensed; growing needs for pharmacists within the pharmaceutical and biotechnology industries; increases in the number of new drugs and pharmacies; and a widening scope of practice will further increase demand for pharmacy services. California pharmacists are assuming new roles as advisors for patients with chronic diseases; as industry experts on a wide spectrum of topics and in a variety of settings; and as central advisors in the development and assessment of new drugs. UC's advanced level training programs at UCSD and UCSF yield qualified graduates who are in strong demand to fill critical roles in the state's pharmacy workforce.

9. California's veterinary workforce is unable to meet growing demand for veterinary services.

The rate of relative growth in the number of veterinarians (about 1% per annum) places California 49th among all states in the nation. Demand for the broad range of highly sophisticated veterinary services is rising at an unprecedented pace as pets are increasingly regarded as family members by their owners. The demand for public practice veterinarians to ensure the health of food animals and safety of food, and to collaborate with public health systems in the event of an accidental or intentional animal disease outbreak is also growing too rapidly for current educational programs to meet. Veterinary faculty retirements nationwide are expected to deplete the supply of veterinary educators by 38% by the year 2014. UCD, home to the only School of Veterinary Medicine in the UC system, plays a critical role in meeting California's veterinary workforce needs with an estimated 75% of its graduates annually electing to practice in the state.

10. There is a maldistribution of dentists and a growing shortage of dental school faculty.

In California, the dentist-to-population ratio exceeds the national average. The challenges linked to maldistribution of dentists, however, remain unsolved. By federal standards, 20% of California communities containing 12% of the state's population, have shortages of dentists. A steady number of new graduates are needed to replace dentists who are leaving practice to retire, and to address current and predicted shortages of dental school faculty. The UCLA and UCSF Schools of Dentistry are nationally recognized for the depth, breadth, and caliber of their programs, the range of interdisciplinary degree offerings, the strength of their faculties, and the quality of the clinical services provided.

11. There is a steady need for practicing optometrists and an increasing shortage of faculty.

Studies predict that more optometrists are expected to enter practice than will be leaving it, leading one recent study to conclude that the supply of optometrists will increase steadily through 2030. Others argue that this growth will be offset by a number of factors, including the increased presence of managed care, the expanded scope of optometry practice, increases in vision insurance coverage, and greater numbers of optometrists practicing less than full time. These variables suggest that although no growth in enrollment is needed, there will be a steady need for new graduates over the next 10 years to replace those who are retiring or leaving clinical practice to pursue other activities. The UCB School of Optometry, ranked at the top of its field nationally and internationally, is highly selective and attracts growing numbers of talented students. Many of the brightest new graduates in the field apply

to UCB for residency training. However, because of the lack of stable support for salary and benefits for UC optometry residents, the school is able to support only 4 of 12 approved residency training positions. In contrast to residency training in medicine, dentistry, pharmacy, and veterinary medicine, which receive state support for a portion of the salary stipends for residents based at UC-operated hospitals and clinics, the School of Optometry receives no state or core university funding for this purpose. This budget limitation keeps the school from benefiting from many teaching and clinical care activities that a larger residency program would allow, such as expanded patient care services and increased preparation of specialists and new faculty.

The University of California Health Sciences Instructional Programs

12. UC health sciences programs are leaders in teaching, clinical care, and research.

Excellence in teaching: UC health professions schools are in the top tier of education programs in medicine, dentistry, nursing, public health, pharmacy, optometry, and veterinary medicine. Competition for admission to these highly selective schools is intense and increasing steadily, with far more qualified applicants than can be accommodated. UC students bring diverse educational backgrounds and exceptional records of personal and academic achievement to these programs. The University's nationally recognized health sciences faculty design and deliver an updated, interdisciplinary curriculum that prepares students and residents as future health care providers. The breadth and depth of academic resources within the system also provide UC students and residents opportunities to participate in a variety of high-quality, advanced-degree programs and interdisciplinary research opportunities. UC's health sciences faculty comprise outstanding teachers and researchers, including seven Nobel laureates.

Major statewide provider of clinical care: UC medical centers, hospitals and clinics, and the faculty, students, and staff who learn and work in them, represent the fifth largest health delivery system in California, providing an estimated 3.6 million outpatient visits; 239,000 emergency room visits; and 135,000 inpatient admissions each year. As the second largest Medi-Cal provider in the state, the UC system makes major contributions toward meeting the needs of insured, underinsured, and uninsured Californians through a wide range of programs and state-of-the-art health services.

Leader in health sciences research: UC health sciences programs are highly regarded nationally and internationally for the breadth and depth of their federal, state, and privately funded biomedical and health science research activities. The research conducted at UC health

sciences schools was funded with over \$1 billion in grants from the NIH in fiscal year 2003 alone, ranking UC faculty and programs in the top tier nationally with respect to total research funding.

13. UC health sciences programs face major challenges.

For the 2004-2005 fiscal year, the University will have sustained nearly \$490 million in base budget reductions; another \$420 million in cuts will have been offset with student fee increases, and an additional \$550 million "gap" reflects the absence of funding for cost-of-living adjustments, non-salary price increases, employee health benefit increases, and other expenses. With the exception of a one-year exemption for nursing, UC health sciences schools have taken proportional multi-year cuts, including an unprecedented 25% reduction in state support (offset by corresponding fee increases) in 2004 – 2005.

Sustaining quality: As UC health sciences schools absorb unprecedented budget cuts, they face increasing demands for faculty productivity in clinical settings; near-term shortages of faculty; and new challenges in balancing time for teaching research. As a result, UC health sciences schools are increasingly calling upon volunteer clinical faculty to help fulfill teaching responsibilities. Many teaching, research, and clinical facilities are aging and no longer meet current standards for teaching and/or clinical purposes. While commitment to quality remains the highest priority, the University's ability to maintain quality and access to education will be seriously jeopardized if further budget cuts occur.

Maintaining access: Recent multi-year fee increases for health sciences students will have immediate and long-term negative effects for both students and the communities they will serve. Fee increases and heavier debt loads will discourage many students from educationally and financially disadvantaged backgrounds from pursuing careers in the health sciences. The University's efforts to improve the diversity of its health professions classes will face greater challenges as a result. Increasing educational costs and student indebtedness will also create growing disincentives for graduates to consider careers and practice locations in medically underserved areas, which will hinder efforts to improve access to care in California's many health professional shortage areas.

Meeting demands for education: With the exception of the new UCSD School of Pharmacy which admitted its first class of 25 students in Fall 2001, educational opportunities in most of the health professional programs offered at UC have not increased for more than 25 years. California now leads the nation in the number of medical students who must leave the state to attend medical school. Because opportunities for medical education in California are roughly half of the national average (15.6 California medical students/100,000 population vs. 27.1 U.S. medical students/100,000), more California students now enroll

in medical schools outside of the state than in it. Opportunities for a veterinary education in California are among the lowest in the nation. And, since enrollment in UCLA's baccalaureate nursing degree program was suspended in 1995, college-bound high school graduates have not had an available option for pursuing an undergraduate degree in nursing anywhere in the UC system.

Improving diversity among students and faculty: The recruitment of underrepresented educators and researchers continues to be a major challenge in developing successful strategies for addressing disparities in health status and the needs of medically underserved communities. As health sciences programs engage in curricular reform and work to address the needs of all Californians, UC will need faculty who are able to care for patients and teach students from diverse backgrounds, to teach and demonstrate the importance of cultural and linguistic competence, to act as mentors and role models, and to encourage underrepresented minority students to consider health sciences careers in general, and academic and research careers in particular.

Addressing faculty shortages: An adequate supply of qualified faculty is essential for meeting the state's health workforce needs and for maintaining high standards in education, research, and patient care. The number of health professionals interested in faculty careers appears to be declining and shortages are expected to increase as faculty retirement rates continue to exceed the number of new graduates available to replace them. In recent years, the recruitment of faculty in veterinary medicine, dentistry, nursing, optometry, and pharmacy has become increasingly difficult due to limits in post graduate training opportunities, small candidate pools, salary limitations, and rising costs of living in California.

Improving faculty morale: The role of health sciences faculty is multifaceted. Faculty are expected to be fiscally productive in both the clinical and research arenas, and to advance within the academic system when they do so. Increasing demands for productivity mean less time for teaching in both inpatient and outpatient settings. These present-day realities offer reduced incentives for teaching, which is often unrewarded (i.e., not reimbursed or used for academic promotion). Schools are increasingly calling upon volunteer clinicians to help fulfill clinical teaching responsibilities. Challenges in meeting the growing demands of various public and regulatory bodies add to overall workloads, and require faculty time and expertise, but frequently this occurs without sufficient "release time" from teaching, patient care and research responsibilities.

Meeting infrastructure and capital needs and developing new educational paradigms: Many UC teaching, research, and clinical facilities are aging or no longer meet current standards ranging from seismic safety to suitability for current programmatic purposes. New

resources and strategies are needed to meet capital and infrastructure needs. UC health sciences schools have undergone major changes to better prepare providers to meet changing patient needs and to practice more effectively within changing health systems. Evidence-based learning, small group instruction, and use of technology and informatics are among the educational resources that faculty use to prepare students to provide care in a variety of settings using integrative, interdisciplinary, disease management models. New areas of curricular emphasis emerge on an ongoing basis, requiring that faculty learn and develop new expertise and teaching techniques. Investment in educational technologies and faculty development programs is essential for ensuring that UC programs meet current standards in education and patient care.

14. Growth in UC health professions programs is necessary for meeting state needs.

The University has a central role in educating and training both health care professionals and faculty for the state and the nation. While the growth recommended by the HSC in five of UC's health professions programs will not be sufficient for meeting all (or even most) state needs, an absence of growth in these programs will severely limit options in California.

15. Planning and review of statewide health workforce data and the contributions of UC-trained health professionals is needed on an ongoing basis and is essential for state and regional planning.

Reviewing data regarding California's health professions workforce, including periodic assessments of the supply and demand for health services within the context of state population needs, provides useful information for assessing the number of health care providers that California will need in the future. Workforce studies and new forecasting models are useful in planning and guiding policies to improve the supply and distribution of health professionals. The underdevelopment of the alumni databases for UC health sciences schools limits UC's ability to determine how and where its graduates are employed and how they contribute to the workforce. More information is needed to categorize the jobs and the sectors in which UC alumni work and to learn more about their educational and professional achievements and activities. Ongoing planning and coordination of these and other activities are needed to ensure that UC health science programs are poised and prepared to respond to California's needs.

RECOMMENDATIONS

To meet the growing health workforce needs of the state, changes in the size, distribution and preparation of the California health workforce are required [see Findings in Section VI]. As the largest health sciences instructional program in the nation and as the state's designated public research university, UC should continue to play a major role in training health professionals to meet the needs of Californians. As part of these efforts, UC should regularly review and respond to statewide and regional shortages for those health professions (and specialties and subspecialties) in which UC offers education and clinical training. For UC, these needs should be monitored in light of population, economic, and disease burden trends and should be addressed within the context of the University's overall mission and unique role in each profession.

To address California's current and future needs, growth in several UC health professions programs is required. In planning for such growth, UC must ensure that new programs and proposed enrollment increases meet and maintain high standards of quality in teaching, research, and patient care programs. In the wake of multi-year budget cuts and corresponding fee increases for students, maintaining the quality of UC training programs will require renewed efforts to restore competitive salaries for faculty and staff and adequate funding to meet current and projected capital needs. It will also require re-examination of the ramifications of fee increases for educational access and student indebtedness, and of the consequences of these changes as they relate to the career and practice choices of UC health sciences graduates. Although growth in UC programs will not be sufficient for meeting all (or even most) state needs, an absence of growth in UC programs would severely limit options in California. Within this context, and based upon the in-depth review undertaken as part of this systemwide planning effort, the HSC offers the following recommendations:

Increasing Health Sciences Enrollments

1. UC should increase health sciences enrollments in professions and areas of compelling state need. New programs and recommended enrollment increases must meet high quality standards and should reflect consideration of both state needs and the University's role in meeting them. Within this context, profession-specific recommendations include:

MEDICINE: UC should begin immediately to increase medical student enrollment growth at existing campuses; to increase resident enrollment in UC programs; and to plan for development of one or more comprehensive new medical education programs that should enroll new medical students by (or before) 2020. Specifically:

- UC medical schools should increase enrollment by 10% (a total of 65 new first-year medical students systemwide) by no later than 2008. Increases should begin as soon as possible. Campus-specific increases should reflect consideration of local priorities and/or constraints (e.g., space, current class size, etc).
- UC should increase enrollment in residency training programs by at least 15-20% (approximately 150-200 new first year residents systemwide), beginning as soon as possible.
- The University should begin immediately to assess the feasibility of developing one or more comprehensive new medical student education programs by (or before) 2020, provided that growth in existing programs is achieved and adequately funded. Appropriate sites for new programs should include regions of California that are medically underserved and/or projected to experience significant physician shortages in the future (e.g., the Inland Empire and the Central and South Valley).
- Planning for new programs at UC sites should anticipate an ultimate need for an increase of up to 200 additional UC medical students, in one or more new locations, phased in over time. A variety of approaches should be considered for achieving these goals, including adopting or designing innovative educational programs that involve new sites. This growth, together with growth at existing campuses, would result in up to 265 new medical school graduates annually.

NURSING: UC should participate actively in addressing California's nursing shortage by increasing enrollment in graduate education programs to meet the statewide demand for new nursing faculty. UC should re-establish a baccalaureate-level nursing program to offer UC-eligible students at least one option for pursuing undergraduate nursing training at UC and to increase the number of nursing school graduates who go on to graduate school. Specifically:

- The UCSF School of Nursing should add 32 new students per year to their three-year Master's Entry Program in Nursing (MEPN) at a proposed satellite site in an area of state need (e.g., Fresno or Sacramento). The existing UCSF-based MEPN program taps the pool of college graduates as a qualified group for entry level and advanced practice programs in nursing. Students enter the MEPN program with a commitment to full-time, intensive study for the first year of the three-year program, after which they are eligible to take the RN licensure exam. Students then work as RNs full- or part-time while completing coursework for the master's degree.

- The UCLA School of Nursing should expand access for community college graduates by increasing enrollment by 24 students (8 per year for 3 years) in its existing Associate Degree/Bachelor of Science/Master of Science in Nursing (AD/BS/MSN) program.
- To address the state's critical shortage of baccalaureate-prepared nurses, the UCLA School of Nursing previously proposed (in March 2002) re-establishment of the undergraduate nursing program with admission of 50 students per year as upper division nursing majors. This proposal should be reactivated, or others developed and considered.
- At the graduate level, the UCLA School of Nursing is now considering the implementation of a new Entry Clinical Nurse Leader Program with an enrollment of 50 students per year. This program would prepare those with a baccalaureate degree in other disciplines (biology, psychology, sociology, etc.) for professional bedside nursing.
- UC should expand graduate programs to prepare increasing numbers of graduate students for future careers as faculty or advanced practice nurses. To help meet the urgent need for new faculty, UCSF has proposed offering a specialty in nursing education for 12 students per year as a new major within the existing master's program. By placing emphasis on the teaching role (rather than on a clinical specialty) it is expected that a majority of these students would pursue faculty careers.

PUBLIC HEALTH: To respond to serious and growing deficiencies in the state and national public health workforce, UC should expand opportunities for preparing future public health professionals to work in settings and disciplines of greatest need.

- UC Schools of Public Health should increase enrollments in their master's degree programs by 25% by 2010, and by an additional 25% between 2010 and 2015. As part of this growth, particular attention should be given to fields that are responsive to workforce and community needs.
- Increased enrollments in public health, like those in other professions, will in some cases require capital improvements. Although two UC health sciences campuses that do not currently have public health schools are developing public health programs (UC Davis and UC Irvine), existing schools should be given consideration and priority with respect to initial enrollment increases.

PHARMACY: To meet growing demands for pharmacists in all disciplines and to better serve all Californians, UC should expand educational opportunities at both Schools of Pharmacy to prepare culturally and

linguistically competent pharmacists to care for California's growing and aging population. The expanding scope of pharmacy practice requires broad-based learning and learning tools that will fully prepare future pharmacy professionals.

- As soon as the planned phase-in of pharmacy student enrollment growth is complete at UCSD's new school of pharmacy (current plans call for growth from 25 first-year students in 2000 to 60 students in fall 2006), UC pharmacy schools should plan to increase enrollment by approximately 35 first-year students per year (from 60 to 70 first-year students per year at UCSD; and from 117 to approximately 140 first-year students per year at UCSF).
- The Schools of Pharmacy should concurrently plan to increase the number of first-year residency training and fellowship opportunities by as much as 50% of current enrollments at both campuses.

VETERINARY MEDICINE: To meet the rapid increase in demand for veterinary services, UC should initiate plans for sufficient growth to ensure that California's veterinary workforce remains nationally competitive in both number and quality. For the School to continue to successfully compete for new faculty and to maintain its leadership position within the profession, more graduate academic training positions for veterinarians must be created. Specifically:

- Once the new veterinary medicine educational facilities at UCD are complete (scheduled for 2006), the School of Veterinary Medicine (SVM) should increase enrollment by 29 students per year (increasing class size from 131 to 160 first year students); UCD residency positions should increase from 30 first-year positions to a total of 50 per year; and the number of graduate student positions should increase from 34 first-year graduate students to a total of 55 first-year graduate students.
- UC should begin immediately to assess the feasibility of establishing a second comprehensive new veterinary medicine program or school. One option for meeting the growing demands for veterinary services exists through the UC Veterinary Medicine Center-San Diego, a joint initiative between the UCD SVM and UCSD. Independent of site, however, workforce projections support the need for a comprehensive program to address anticipated shortfalls of approximately 200 veterinarians annually. If UC were to meet only half of this need, funding to support facilities and faculty to train an additional 400 DVM students (i.e., 100 students per year in each of four years) would be required. To fulfill the University's long-standing role in preparing future faculty, an additional enrollment of 90 residents (30 students per year) and 120 graduate students (30 students per year) would be appropriate.

DENTISTRY: Although no shortage of practicing dentists is predicted over the coming decade, faculty shortages exist in California and nationally. These shortages are expected to grow over the next 10 years as retirement rates increase. The state currently needs and will continue to require a steady number of new graduates who are committed to faculty careers, and to replace those who leave the field to retire or pursue other activities.

- The UCLA and UCSF Schools of Dentistry should maintain enrollments for dental students and dental residents at current levels.
- Both UC Schools of Dentistry should develop and support new initiatives to address statewide and national shortages of dental school faculty.

OPTOMETRY: No shortage of practicing optometrists is predicted in California or nationally. Like dentistry, however, the state will need a steady number of new graduates to replace those who leave the field to retire or pursue other activities. Unlike residents enrolled in UC medicine, dentistry, pharmacy, and veterinary medicine programs, UC Berkeley receives no state funding to help support stipends for its residents. As the top-ranked school in the nation, stable support for this small residency program is needed to train graduates who are committed to faculty careers and to replace those who leave the field to pursue activities other than patient care.

- The School of Optometry should seek approval for stable funding of stipends and benefits for its residency training program. Although the UCB Graduate Division has approved 12 slots, the School is able to fund only 4 of its 12 residency positions.
- To ensure an adequate critical mass for teaching and program quality, and to address corresponding accreditation concerns about the small size of the residency program, UCB should plan to increase first-year residency slots at UCB from 4 students per year (in 2004) to 15 by 2007, and to 20 by 2010.

Meeting the Needs of the Underserved

2. While many Californians benefit by access to state-of-the-art health services, millions lack adequate access to care. To help meet these needs, UC health sciences schools should: increase recruitment of students who possess a record of service or expressed commitment to caring for the underserved; develop focused curricula and training opportunities to prepare students for such service; collaborate and share resources with agencies serving those in need; and work to increase funding for and access to state, federal, and regional programs that provide incentives to recruit and retain clinicians in health professions shortage areas.

Increasing Student and Faculty Diversity

3. UC should intensify efforts to increase student and faculty diversity by identifying best practices and developing model programs applicable for the health sciences and by developing and implementing comprehensive strategies that include: academic preparation, outreach, pre-college and college health sciences advising, improved access to scholarships and financial aid, and improved recruitment of students from medically underserved communities. New incentives should also be identified to improve the recruitment and retention of graduate students and faculty from groups who are underrepresented in the health professions.

ACADEMIC PREPARATION, OUTREACH, AND ADVISING: To increase diversity of the student body, and ultimately that of the faculty, new and continuing efforts are needed. UC schools should develop and participate in academic enrichment programs designed to improve the preparation of high school and undergraduate students for health sciences careers and to increase awareness about educational opportunities in the health professions. UC should also create mentoring programs designed to encourage students from medically underserved communities to consider a health sciences career and to support those interests over time. Dedicated support for pre-college and college advising and for outreach activities should be stabilized; and continuing efforts should be made to improve the quality and consistency of health sciences advising.

FINANCIAL AID AND SCHOLARSHIP SUPPORT: Financial aid and scholarship support should be increased, including dedicated efforts and resources to meet the needs of financially and/or educationally disadvantaged students. This need has never been greater for UC health professions students who have experienced huge, multi-year fee increases in recent years and are graduating with unprecedented debt. In medicine, for example, educational costs and living expenses now total approximately \$45,000 annually (or approximately \$180,000 over 4 years) resulting in an average debt burden of \$120,000. This debt is expected to grow steadily as the near 25% fee increases imposed in fall 2004 take effect for all UC medical students. The magnitude of these recent changes is such that UC students graduate with substantially more educational debt than medical school graduates of private schools that are able to offer generous scholarship packages.

ADMISSIONS AND RECRUITMENT: Continuing efforts should be made within all UC health professions schools to review and adopt best practices to identify and recruit qualified students from educationally disadvantaged backgrounds and/or from medically underserved groups and communities throughout the state. UC health sciences schools should develop and/or maintain: “pipeline” efforts to improve preclinical

sciences education; mentoring and preceptorship initiatives; and new and effective partnerships to recruit students from California Community College and California State University campuses.

POST-BACCALAUREATE PROGRAMS: UC post-baccalaureate programs in medicine and dentistry provide up to a year of training for students who are either applying to school for the first time or who have previously applied but failed to gain admission. These programs are targeted to meet the individual needs of students in areas ranging from improved academic preparation to review and assistance with the application process. UC post-baccalaureate programs have outstanding track records, as measured by the success of graduates in gaining admission to schools at UC or elsewhere, yet several were recently reduced in size as a result of state budget cuts. These programs should be continued with stable funding and expanded where possible.

Developing New Curricula and Teaching Methods

4. UC health sciences programs should take leadership roles in developing and implementing curricular changes that are responsive to changing population health needs, student learning needs, public expectations, and applicable requirements for patient care and health professions education. UC should identify, develop and disseminate best practices for teaching and model programs for learning. Current areas of focus include but are not limited to:

INNOVATIVE TEACHING STRATEGIES: UC schools should build on their successes in developing teaching methods that help students merge knowledge across subject boundaries and gain the integrative skills needed to care for patients in professional practice. This will require changes in faculty FTEs and support for changes in infrastructure.

HEALTH DISPARITIES: Significant disparities in health status and health outcomes exist between whites and other racial and ethnic groups. For many, race and ethnicity-based disparities in health status are a result of limited access to health services, lack of adequate insurance, and inadequate availability of health care professionals. Many state and national policy initiatives are driven by the need to improve access to care, reduce health disparities, and respond more effectively to population-based needs. To improve health outcomes for Californians, health professionals, faculty, and researchers will need a greater understanding of the disparities that exist between racial and ethnic groups. UC schools should assume leadership roles in this area, linking research and teaching to improved patient care.

CULTURAL AND LINGUISTIC COMPETENCE: UC schools should ensure that health professions graduates are prepared to work and provide health services in a culturally and linguistically diverse world. Enhanced

education in these areas should occur through a variety of mechanisms, including collaboration with culture-focused academic programs (e.g., sociology, ethnic studies); partnerships with community organizations that address cultural issues; and/or focused curricula within the overall instructional program. UC schools should develop and maintain efforts to increase cultural and linguistic competence by seeking to instill values of multiculturalism, tolerance, and professionalism and by developing new curricula that are responsive to changing societal health needs.

NEW AND/OR EXPANDED DEGREE PROGRAMS: UC schools should develop and expand innovative mechanisms for interaction and collaboration in teaching, research, and clinical care across the health professions. Such efforts should include inter- and trans-disciplinary training opportunities between health professions schools on the same campuses; development of new joint/combined degree programs; and use of clinical training sites that foster collaboration among professionals and promote interdisciplinary models of care.

Recruiting and Retaining Faculty

5. UC schools should develop and support new and existing initiatives to improve competitiveness in the recruitment and retention of faculty; to improve faculty productivity and morale; and to preserve and sustain the University's role and record of achievement in preparing new faculty for UC, the state, and the nation.

RECRUITMENT AND RETENTION: To retain current faculty and restore UC's competitiveness in the recruitment of new faculty, renewed efforts should be made to provide competitive salaries, which presently lag behind comparison universities by approximately 10%. Periodic review of benefits and clinical compensation plans to ensure competitiveness is also needed. Those health professions that do not presently utilize clinical compensation plans should consider the advantages and disadvantages of creating them. Innovative programs are also needed to assist new faculty in relocating and finding affordable housing near UC campuses.

PROFESSIONAL DEVELOPMENT: UC schools should provide professional development strategies that enable faculty to carry out teaching responsibilities, pursue scholarly activities, and develop and maintain focused research programs. Faculty development opportunities and rewards should be created to maximize acceptance and implementation of new curricula and teaching methods, and to support interdisciplinary collaboration in teaching, research, and clinical care.

PREPARATION OF NEW FACULTY: UC health sciences schools play important roles in preparing and training future faculty and utilize a variety of recruitment and development strategies in doing so. Faculty

shortages (at UC and nationally) currently exist in many of the health professions and will grow over the coming decade. UC schools should continue their leadership roles in preparing and training new faculty and should actively recruit students interested in future faculty careers. Provision of grants and opportunities to repay financial obligations through teaching should be increased; programs involving mentorship, specialty and teacher training, and other development efforts should be offered to help prepare graduate students for faculty careers; and adequate support (funds, staff, and time) to allow junior faculty to create research agendas should be provided.

Expanding Graduate, Postgraduate, and Continuing Education

While this report focuses primarily on the need for growth in health professions programs that produce graduates who are trained to provide direct patient care, it is important to emphasize that graduate, postgraduate, and continuing education programs are critical elements of all UC health sciences programs. These include academic and public service programs that prepare advanced-level practitioners, faculty, researchers, policy makers, and future leaders.

6. Although beyond the scope of this report, UC health sciences schools should review and consider the need for growth in other health sciences graduate, postgraduate, and continuing professional education programs. New and creative programs should be developed that promote distance learning, enhance executive education, encourage life-long learning, and facilitate continuing health professions education. Such programs should be expanded into new formats and locations, enabling practitioners throughout the state to participate. In public health, for example, new programs could increase both the number and qualifications of those working in the field.

Addressing Capital and Infrastructure Needs

7. UC health sciences schools should develop new plans and strategies for meeting and funding capital, infrastructure, and technology needs.

As UC health sciences schools grapple with budget cuts, deferred maintenance, delays in capital projects, and plans for growth, new strategies will be necessary for addressing and funding these needs. Upgrades in many teaching, research and clinical facilities are currently needed, and other changes will be required as health sciences education and clinical training move away from lecture-based to small-group instruction and, in many cases, from inpatient academic health centers to a variety of outpatient, ambulatory care, and other settings. Investments in new technologies for teaching and providing patient care are also

needed to meet current educational and professional standards, to improve clinical instruction and patient care, and to increase productivity and efficiency in all sectors of the health sciences enterprise.

Planning and Coordination

8. UC should ensure that ongoing coordination, review, and planning continues with respect to proposed changes in UC health professions programs, and that health sciences schools remain informed and participate actively in these efforts.

UC health sciences enrollments have not increased appreciably in size for nearly a quarter of a century. As consideration is given to the recommendations outlined in this report, ongoing coordination, review, and planning will be needed. Systemwide coordination involving proposed health sciences enrollment growth over the next decade should be paired with a continuing commitment to monitor state and national health and health workforce needs and to identify recommended changes. Improved tracking of UC health sciences alumni and their career and practice activities would also be a valuable resource as part of the University's ongoing planning efforts. The HSC is prepared to assist with these efforts as directed.

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Appendix D

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Appendix E

REFERENCES

Dentistry

- A. Noonan and C. Evans, "The Need for Diversity in the Health Professions." *Journal of Dental Education* 67 no. 9 (2003): 1030-1033.
- American Dental Association (ADA), Survey Center, *Distribution of Dentists; AMA, Physician Characteristics and Distribution in the U.S.; and U.S. Bureau of the Census, "Resident Population Estimates of the United States by Sex, Race, and Hispanic Origin: April 1, 1990 to July 1999, with Short-Term Projection to November 1, 2000."* Available from: eire.census.gov/popest/archives/national/nation3/intfile3-1.txt. [cited 2002 May 8].
- ADA, Survey Center, *Survey of Dental Practice, 1996*. Chicago: American Dental Association; 1997.
- American Dental Association, Survey Center. *Distribution of Dentists in the United States by region and State, 1998 and 1999*. U.S. Bureau of the Census. *Statistical Abstract of the United States*, 2001.
- ADA. Dentistry Definitions. Available at: <http://www.ada.org/prof/ed/specialties/definitions.asp>. [cited 2004, May 23].
- B. Bloom et al., "Dental Services and Oral Health: United States, 1989," *Vital Health Stat* 10, no. 183 (1992): 1-95.
- B.A. Waldman, "The Manpower Issue in Pediatric Dental Education: Our Job is not Finished!" *Pediatric Dentistry* 19 (1997): 185-188
- Bureau of Labor Statistics. *1999 Occupational Employment and Wage Estimates*, Feb. 2002. Available at: http://www.bls.gov/oes/1999/Oes_29He.htm. [cited 2002 May 9].
- C. Manuel-Barkin and E. Mertz, et al., *Distribution of Medicaid Dental Services in California*. San Francisco: Center for California Health Workforce Studies, Center for the Health Professions, Oct. 2000.
- D. Krause et al., "Maximizing the Dental Workforce: Implications for a Rural State." *The Journal of Dental Hygiene* 77 no. IV (2003): 253-261.
- Delta Dental. *Dental is Different from Medical*. Available at: http://www.deltadentalca.org/tre/tre_dandm.html. [cited 2000, Mar 10].
- E. Mertz and E. O'Neil, "The Growing Challenge of Providing Oral Health Care Services to All Americans", *Health Affairs* 21, no. 5 (2002): 65-77.
- E. Mertz et al., *Geographic Distribution of Dentists in California*. San Francisco: Center for California Health Workforce Studies, Jan. 2000.
- E. Salsberg et al., *California Physician Workforce Supply and Demand through 2015 (draft)*. Albany: The Center for Health Workforce Studies. 2004.
- E.A. Mertz and K. Grumbach, "Identifying Communities with Low Dentist Supply in California," *Journal of Public Health Dentistry* 61, no. 3 (2001): 172-177.
- E.A. Mertz et al., *Improving Oral Health Systems in California: A Report of the California Dental Access Project*. San Francisco: UCSF Center for the Health Professions, 2000.
- H. Gift et al., "The State of the Nation's Oral Health: Mid-Decade Assessment of Healthy People 2000," *Journal of Public Health Dentistry* 56 no. 2, (1996): 84-91.
- H. Livingston et al., "The Aging and Diminishing Dental Faculty." *Journal of Dental Education* (2004): 345-354.
- Health Resources and Services Administration (HRSA). Bureau of Health Professions, Office of Research and Planning. *Dental Supply Model, 1999*. Available at: <http://www.hrsa.dhhs.gov/bhpr/healthworkforce/factbook.htm>. [cited 2004 April 15].
- Institute of Medicine. *Dental Education at the Crossroads: Challenges and Change*. M.J. Field, ed. Washington, DC: National Academy Press, 1995.
- Institute of Medicine. *In the Nation's Compelling Interest: Ensuring Diversity in the Health Care Workforce*. Washington, DC: National Academy Press, 2004.

M. Hurlbutt, *Charting a Course for the Future*. California Dental Hygienists Association. Available at: <http://www.cdha.org/docs/hurl.htm>. [cited 2000 Aug. 3]

N.K. Haden et al. *Improving the Oral Health Status of All Americans: Roles and Responsibilities of Academic Dental Institutions. The Report of the ADEA President's Commission*, March 2003.

N.K. Haden et al., "Dental School Faculty Shortages Increase: an update on future dental school faculty." *Journal of Dental Education* 64 no. 9 (2000): 657-673.

N.K. Haden et al., "Meeting the Demand for Future Dental School Faculty: Trends, Challenges, and Responses." *Journal of Dental Education* 66 no. 9 (2002): 1102-13.

U.S. Department of Health and Human Services (DHHS). *Oral Health in America: A Report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.

U.S. Department of Health and Human Services. *A National Call to Action to Promote Oral Health*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention and the National Institutes of Health, National Institute of Dental and Craniofacial Research. NIH Publication No. 03-5303, May 2003.

U.S. General Accounting Office. *Oral Health in Low-Income Populations*. GAO/HEHS-00-72. 2000 Apr.

Medicine

2005-2006 Budget Draft, University of California Office of the President, October 2004.

ACP's Comments on the Council on Graduate Medical Education's (CoGME) draft report entitled *Reassessing Physician Workforce Policy Guidelines for the U.S. 2000-2020*. May 25, 2004. Available at: <http://www.acponline.org/hpp/CoGME.htm>.

Alliance for Academic Internal Medicine (AAIM), Medical Education Regulatory and Legislative Information Network (Merlin). *COGME Draft Report Finds Likely Shortage of Physicians; AAIM Solicits Member Comments*. May 7, 2004.

American Association of Medical Colleges, "Applicants to U.S. Medical Schools Increase." Press release, November 4, 2003. Available at: <http://www.aamc.org/newsroom/pressrel/2003/031104.htm>.

American Association of Medical Colleges. *CoGME Recommends Expansion of Physician Workforce*. Available at: <http://www.aamc.org/advocacy/library/washhigh/2004/080604/start.htm>

Barzansky B and Etzel SI, "Educational Programs in U.S. Medical Schools, 2003-2004." *JAMA* 2004;292:1025-1031.

Brotherton SE, Rockey PH, and Etzel SI, "U.S. Graduate Medical Education, 2002-2003." *JAMA* 2003;290:1197-1202.

Brotherton SE, Rockey PH, and Etzel SI, "U.S. Graduate Medical Education, 2003-2004." *JAMA* 2004;292:1032-1037.

Families USA. *Californians without Health Insurance*, June 2004.

Centers for Disease Control, National Center for Chronic Disease Prevention and Health Promotion: *Chronic Diseases, Risk Factors, and Preventive Services: Burden of Chronic Diseases, 2001*. Available: <http://apps.nccd.cdc.gov/BurdenBook/>.

Coffman J, Quinn B, Brown, T, et al. *Is There a Doctor in the House? An Examination of the Physician Workforce in California over the Past 25 Years*. Nicholas C. Petris Center on Health Care Markets and Consumer Welfare, University of California, Berkeley, June 2004.

Cooper RA, "Medical Schools and Their Applicants: An Analysis." *Health Affairs* 2003;22:71-84.

Council on Graduate Medical Education. *Eighth Report: Patient Care Physician Supply Requirements*. November, 1996.

Elliott VS, "Physician Shortage Predicted to Spread." *Amednews.com*, January 5, 2004. Available at: <http://www.ama-assn.org/amednews/2004/01/05/prl20105.htm>.

Escarce JJ, Polsky D, Wozniak, GD, and Kletke PR, "HMO growth and the geographical redistribution of generalist and specialist physicians, 1987-1997." *Health Serv Res* 2000;34:825-848.

Greene J, "Physician retire earlier in HMO-saturated markets." *AMNews* April 23/30, 2001.

Hallock JA, Seeling SS, and Norcini JJ, "The International Medical Graduate Pipeline." Health Affairs 2003;22:94-96.

Health Sciences Education Institute Report. Division of Health Affairs, University of California Office of the President, June 2004.

McMahon GT, "Coming to America – International Medical Graduates in the United States." N Engl J Med 2004;350:24.

National Resident Matching Program, 2004 Match Data. Available: http://www.nrmp.org/res_match/tables/table6_04.pdf; http://www.nrmp.org/res_match/tables/table2_04.pdf

Newton DA and Grayson MS, "Trends in Career Choice by U.S. Medical School Graduates." JAMA 2003;290:1179-1182.

Salsberg E and the Center for Health Workforce Studies. *California Physician Workforce: Supply and Demand through 2015*. University at Albany, State University of New York, August 2004.

Salsberg E and the Center for Health Workforce Studies. *Residency Training Outcomes by Specialty in 2002 for California: A Summary of Responses to the 2000-2002 CA Resident Exit Surveys*. University at Albany, State University of New York, March 2003.

Salsberg ES and Forte Gaetano J, "Trends in the Physician Workforce, 1980-2000." Health Affairs 2002; 21:165-173.

Terry K, "Jobs 2004: Primary Care Outlook." Medical Economics, May 2004. Available at: <http://www.memag.com/memag/article/articleDetail.jsp?id=108927>.

U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, National Center for Health Workforce Analysis: *Changing Demographics and the Implications for Physicians, Nurses, and Other Health Professionals*, Spring 2003.

U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions: *State Health Workforce Profiles: California*. Available at: <ftp://ftp.hrsa.gov/bhpr/workforceprofiles/california.pdf>.

University of California Health Professions and Outreach. *An Overview of Outreach and Service Programs Sponsored by the University's Schools of Medicine, Dentistry, and Optometry*. Division of Health Affairs, University of California, Office of the President, March 2003.

Nursing

American Association of Colleges of Nursing, "AACN endorses Nurse Employment and Education Development Act aimed at addressing the nation's nursing shortage." Available at: <http://www.aacn.nche.edu/Media/NewsReleases/needact.htm>. (cited 2001, June 15).

American Association of Colleges of Nursing. AACN supports the Nurse Reinvestment Act aimed at addressing the nation's nursing shortage. Press Release. Available at: <http://www.aacn.nche.edu/Media/NewsReleases/reinvestment.htm>. (cited 2001, June 15).

American Hospital Association. AHA Workforce Survey Results. Workforce Data Fact Sheet. Available at: <http://www.aha.org/workforce/resources/FactSheetB0605.asp>. (cited 2001, June 15).

American Organization of Nursing Executives. *Perspectives on the Nursing Shortage: A Blueprint for Action*. Washington, DC. Author. (2000).

Anderson, C.A., "Academic nursing: a desirable career?" Nursing Outlook, 46, 5-6. (1998).

Bachelor of Science in Nursing, statewide distance BSN program in partnership with Kaiser Permanente. Program overview available at: <http://nursing.fullerton.edu/Program/BSNDistance.html>

Barnes, C and Sutherland, S. Survey of Registered Nurses in California, 1997. Sacramento, CA: California Department of Consumer Affairs, Board of Registered Nursing. (1999).

Berlin, L.E., Bednash, G.D., and Stennet, J. 2000-2001 Enrollment and Graduations in Baccalaureate and Graduate Programs in Nursing. Washington, DC: American Association of Colleges of Nursing. (2001).

Berlin, L.E., Bednash, G.D., and Stennet, J. 2000-2001 Salaries of Instructional and Administrative Nursing Faculty in Baccalaureate and Graduate Programs in Nursing. Washington, DC: American Association of Colleges of Nursing. (2001).

Board of Registered Nursing. 2000-01 List of Approved Schools [EDP-1-05]. Sacramento: Author. (2000, September).

Buerhaus, P.I., Staiger, D.O., and Auerbach, D.I., "Implications of an aging registered nurse workforce." JAMA, 283(22),2985-2987. (2000).

Bureau of Labor Statistics. Registered Nurse Occupation. National Industry-Occupation Employment Matrix. [1999, November 30]. Available at: <http://stats.bls.gov/asp/oepl/nioem/empiohm.asp>. [cited 2001, June 15].

California Healthcare Association, "Legislative Proposal to Increase RN Graduates Wins Approval of Key State Senate Committee - SB 317 Provides \$120 Million to Address Severe Nurse Shortage." Press Release. [2001, April 25]. Available at: http://www.calhealth.org/adv_media.pr2001_0425a.htm. [cited 2001, June 8].

California Healthcare Association, "California hospitals sponsor legislative package to address nurse shortage." Press Release. [2001, February]. Available at: http://www.calhealth.org/adv_media.pr2k10227.htm. [cited 2001, June 15].

California Strategic Planning Committee for Nursing. Additional RN Pre-Licensure Slots Needed. Issue Summary. [2000, May]. Available at: <http://www.ucihs.uci.edu/cspcn>.

California Strategic Planning Committee for Nursing. Survey of Nursing Program Deans and Directors Regarding Faculty Vacancies. Unpublished. [2001, June].

The California State University, The California Community Colleges, The University of California, Association of Independent California Colleges and Universities. [June 2000]. *Educating California's Future Work Force Report*. AB Scott, 655. Sacramento, CA: CSU, CCC, UC, and AICCU.

Campbell, P. Population projections: States, 1995-2025. Current Population Reports, P25-1131. U.S. Bureau of the Census, Population Division, May, 1997.

Coffman, J., and Spetz, J., "Maintaining an adequate supply of RNs in California." *Image: The Journal of Nursing Scholarship*, 31(4), 389-393. [1999].

Coffman, J., Spetz, J., Seago, J.A., Rosenoff, E., and O'Neil, E. *Nursing in California: A Workforce Crisis*. San Francisco: UCSF Center for the Health Professions. [2001]. Available at: <http://www.futurehealth.ucsf.edu/CWI/nursecrisis.pdf>

Department of Veterans Affairs. VA commits \$50 million to new national nursing initiative. Press Release. [1998, December 18]. Available at: <http://www.va.gov/pressrel/98nni.htm>. [cited 2001, June 22].

Division of Nursing, Bureau of Health Professions, Department of Health and Human Services. *Preliminary Findings from the National Sample Survey of Registered Nurses, 2000*. [February, 2001]. Washington, DC: Author. Available at: <http://bhpr.hrsa.gov/>

Dower, C., McRee, T., Briggance, B., and O'Neil, E. *Diversifying the Nursing Workforce: A California Imperative*. San Francisco: UCSF Center for the Health Professions. [2001] Available at: http://www.futurehealth.ucsf.edu/pdf_files/NDiv.pdf

"Eight local hospitals on board SDSU Nurses Now Program: \$1.6 million program to train 150 additional nurses within four years." [May, 2001]. Press Release. Available at: <http://advancement.sdsu.edu/marcomm/Spring2000News/ReleasesONLY/NursesNow.html>. [cited 2001, June 16].

Fox, S., Walker, P., and Bream, T. *California's Framework for Competency-based Role Differentiation in Nursing*. Sacramento, CA: Association of California Nurse Leaders. [1999].

Frase-Blunt, M. *Faculty Shortages Intensify Nation's Nursing Deficit*. AACN Issues Bulletin. [1999]. Available at: <http://www.aacn.nche.edu/Publications/issues/IB499WB.htm>. [cited 2001, May 15].

Freudenheim, M., Villarosa, L. [New York Times], "Dire Predictions on Nursing Shortage Across Nation, Patient Care in Peril," Report Says. *San Francisco Chronicle*. [2001, April 8]. Available at: <http://www.sfgate.com/cgi-bin/article.cgi?file=/chronicle/archive/2001/04/08/MN182004.DTL>. [cited 2001, June 8].

Gupta, S. [CNN Medical News], "Special Report: U.S. nursing shortage 'going into crisis.'" *CNN.com*. [2001, May 7]. Available at: <http://www.cnn.com/2001/Health/05/07/nursing.shortage/index.html>. [cited 2001, June 8].

Hinshaw, A.S., "A continuing challenge: the shortage of educationally prepared nursing faculty." *Online Journal of Nursing Issues*, 6(1, Manuscript #3). [2001]. Available at: http://www.nursingworld.org/ojin/topic14/tpc14_3.htm.

Moses, E.B. *The Registered Nurse Population, March 1996: Findings from the National Sample Survey of Registered Nurses*. Washington, DC: Health Resources & Services Administration, Bureau of Health Professions, Division of Nursing. [1997].

Panel on the Future of the Health Care Labor Force in a Graying Society. *Who will care for each of us? Panel Report*. Chicago: University of Illinois, College of Nursing, Nursing Institute. (2001, May). Available at: http://www.uic.edu/nursing/nursinginstitute/policy/final_report.htm. [cited 2001, June 15].

Personal Communication. K. Baker, Associate Dean for Student Affairs, School of Nursing, UCLA. (2001, June).

Personal communication. M. Fritz, Nursing Data and Analysis Staff, Division of Nursing, Bureau of the Health Professions, HRSA. (2001, January).

Personal communication. R. Terry, Executive Officer, California Board of Registered Nursing. (2001, February).

Peterson, C., "Nursing shortage: not a simple problem - no easy answers." *Online Journal of Nursing Issues*, 6(1, Manuscript #1). (2001). Available at: http://www.nursingworld.org/ojin/topic14/tpc14_1.htm.

Sechrist, K.R., Lewis, E.M., and Rutledge, D.N. *Planning for California's Nursing Work Force: Phase II Final Report*. Sacramento, CA: Association of California Nurse Leaders. (1999). Available at: <http://www.ucihhs.uci.edu/cspcn>.

Sechrist, K.R., Lewis, E.M. and the California Strategic Planning Committee for Nursing. *Planning for California's Nursing Work Force: Final Report of the Nursing Work Force and Education Forecasting Initiative*. Sacramento, CA: ONE-California, 1996.

Sixth National Sample Survey of Registered Nurses: 1996 [Survey findings on compact disk, PB97-503437]. Bethesda, MD: Department of Health and Human Services, Division of Nursing, Nursing Data and Analysis. (1996).

Staiger, D.O., Auerbach D.I., and Buerhause, P.I., "Expanding career opportunities for women and the declining interest in nursing as a career." *Nursing Economics*, 18(25), 230-236. (2000).

State of California, Department of Consumer Affairs, Board of Registered Nursing. License Data, 1990-2001. Unpublished Reports.

State of California, Department of Consumer Affairs, Board of Registered Nursing. Annual School Reports, 1994-2000. Unpublished Reports.

State of California, Employment Development Department, Labor Market Information Division. *Employment Projections by Occupation*. Sacramento: Author. (1998, July).

Stringer, Heather, "Frozen assets." *Nurseweek*. (2001, June 4). Available at: <http://www.nurseweek.com/news/features/01-06/salaries.html>. [cited 2001, June 15].

University of California. *Health Sciences Planning: The Context and the Issues*. Oakland, CA: University of California, Office of Health Affairs. (1989).

Williams, S., "Split decision: Nursing profession ranks low in desirability despite public's high regard for nurses." *Nurseweek*. (2001, April 16). Available at: <http://www.nurseweek.com/news/features/01-04/splitdecision.asp>. [cited 2001, June 15].

Optometry

American Optometric Association (www.aoa.org)

Dillehay S. *A Program for Improving Faculty Retention in Optometric Education with Implications for Faculty Recruitment Efforts*. Doctoral dissertation, 2003.

Healthy People 2010, National Institutes of Health, U.S. Department of Health and Human Services, 2000.

National Institutes of Health

Optometry (The Journal of the American Optometric Association) May 2000

U.S. Bureau of Labor Statistics

U.S. Center for Health Statistics (cited on AOA webpage w/no details)

Vision Service Plan, Inc., personal communication.

White AJ, Doksum T, and White C. *Workforce Projections for Optometry*. *Optometry* (The Journal of the American Optometric Association), May 2000.

Pharmacy

American Association of Colleges of Pharmacy. (J Patton, Personal communication, June 5, 2002)

American Association of Colleges of Pharmacy: *Pharmacy's Vital Statistics*. Pharmacy Student Facts, 2002.

American Association of Colleges of Pharmacy. *Final Report of the AACP Ad Hoc Committee on Affirmative Action and Diversity*. October, 2000.

AB 2165. California Assembly Committee on Appropriations. Available at: http://www.leginfo.ca.gov/pub/bill/asm/ab_2151-2200/ab_2165_cfa_20020513_124957_asm_comm.html. [cited 2002, May 17].

AB 2935. California Assembly Committee on Appropriations. Available at: <http://www.leginfo.ca.gov>. [cited 2002, May 17].

California Department of Consumer Affairs. Board of Pharmacy. 2003 Lawbook for Pharmacy. Available at: <http://www.pharmacy.ca.gov/>. [cited 2002, April 4].

Center for Health Workforce Studies, School of Public Health, University of Albany, SUNY. (M. Dell, Personal communication, June 4, 2002)

Center for Pharmacy Practice Research & Development. Western University of Health Sciences. (K Knapp, Personal communication, May 23 and 29, 2002)

Health Resources and Services Administration. *The Pharmacist Workforce: A Study of the Supply and Demand for Pharmacists*. Rockville, MD: Health Resources and Services Administration, U.S. Department of Health and Human Services; 2000.

Knapp K, "Studies Help Define New Directions in Pharmacy Workforce Research." *J Am Pharm Assoc*. 2001; 41:654-55

Knapp K, Livesey J, "The Aggregate Demand Index: Measuring the Balance Between Pharmacist Supply and Demand, 1999-2001." *J Am Pharm Assoc*. 2002; 42:391-398.

Knapp K, Gershon S, and Cultice J, "How Many Pharmacists Are in Our Future? The Bureau of Health Professions Projects Supply to 2020" *J Am Pharm Assoc* 2000; 40:757-764.

Mott DA, Sorofman BA, Kreling DH, et al., "A four-state summary of the pharmacy workforce." *J Am Pharm Assoc* 2001; 41:693-692.

Pharmacy Manpower Project 2000. PMP Aggregate Demand Index. Available at: <http://www.pharmacymanpower.com/>. [cited 2002, May 18].

Pharmacy Technician Certification Board. Board Certification Statistics by State as of May 2002. Available at: <http://www.ptcb.org>. [cited, June 4].

Tucker J, "Drug Stores in State Hurt by Lack of Pharmacists." *Oakland Tribune*. Sunday May 26, 2002.

Public Health

Association of Schools of Public Health. 2002 Annual Data Report. Available at: <http://www.asph.org/uploads/adr2002.pdf>.

California Department of Aging. Statistics and Demographics: Facts About California's Elderly. Available at: <http://www.aging.state.ca.us/html/stats/demographics.html>.

Centers for Disease Control and Prevention. 2004. Office of Workforce Policy and Planning. The Public Health Workforce Development Initiative.

Centers for Disease Control. *Ten Leading Causes of Death in the United States*. Atlanta, GA: U.S. Public Health Service, 1994.

Institute of Medicine, 1988. *The Future of Public Health*. National Academy Press, Washington D.C.

Institute of Medicine, 2002. *The Future of Public Health in the 21st Century*. National Academy Press, Washington D.C.

Institute of Medicine, 2003. *Who Will Keep The Public Healthy? Educating Public Health Professionals for the 21st Century*. National Academy Press, Washington D.C.

Institute of Medicine, 2003. *Who Will Keep The Public Healthy? Workshop Summary*. National Academy Press, Washington D.C.

Lurie N. *Assessing Public Health Infrastructures*. RAND Center for Domestic and International Health Security 2003.

Mertz, E. Personal communication re: preliminary results of UCSF Center for California Health Workforce Studies study of public health workforce needs in California. January 2004.

Mertz, E. Personal communication. July 8, 2003.

National Association of City and County Health Officials (NACCHO). Local Public Health Agency Infrastructure: A Chartbook. Available at: <http://www.naccho.org/GENERAL428.cfm>.

NIH Office of Extramural Research. Total NIH Awards to Health Professional Components, Fiscal Year 2002. Available at: <http://grants1.nih.gov/grants/award/trends/dhepubh02.htm>.

Partnership for Public Service. *Homeland Insecurity: Building the Expertise to Defend America from Bioterrorism*. Washington, D.C., p. 18. 2003.

Partnership for Public Service. *Public Health Jobs: Using Your Skills to Ensure the Nation's Health*. Washington, D.C. 2003.

U.S. Census Bureau. Population Division, Population Projections Branch. National Population Projections. 2002.

U.S. Department of Health and Human Services, Health Resources and Services Administration, [2000a]. *The Public Health Workforce: Enumeration 2000*. Washington, D.C.

U.S. DHHS. PHS, HRSA, Bureau of Health Professions. Sixth Report to the President and Congress on the Status of Health Personnel in the United States. DHS No. HRS-P-0D-88-1. Washington, D.C., U.S. DHHS, June 1988.

U.S. News and World Report. 2004. *America's Best Graduate Schools 2004*. Public Health Rankings.

Veterinary Medicine

American Veterinary Medical Association (AVMA), "Vet Med Today; Facts and Figures: Employment and Age of Male and Female AVMA Members, 2003," *JAVMA* 225, no. 6 [2004]: 876-877.

AVMA. Roles of Veterinarians in Human and Animal Health. Available at: <http://www.avma.org/careforanimals/animatedjourneys/aboutvets/roles.asp> [cited: 2004, July 9].

AVMA. What is a Veterinarian? Available at: <http://avma.org/careforanimals/animatedjourneys/aboutvets/aboutvets.asp> [cited: 2004, July 9].

AVMA. The Veterinary Health Care Team. Available at: http://www.avma.org/communications/brochures/health_care/health_carefaq.asp [cited: 2004, July 9].

AVMA. Veterinary Education: Veterinary Colleges Accredited by the AVMA. Available at: <http://www.avma.org/careforanimals/animatedjourneys/aboutvets/vetschools.asp> [cited: 2004, July 9].

AVMA. Employment Outlook. Available at: <http://www.avma.org/careforanimals/animatedjourneys/aboutvets/employment.asp> [cited: 2004, July 9].

AVMA. JAVMA News. The Face of the Veterinary Profession. May 15, 2003. Available at: <http://www.avma.org/onlnews/javma/may03/030515e.asp>. [cited: 2004, Aug. 25].

AVMA. JAVMA News. Town Hall Meeting Surveys Diversity in the Profession. May 1, 2004. Available at: <http://www.avma.org/onlnews/javma/may04/040501e.asp>. [cited: 2004, Aug. 25].

AVMA. Veterinary Education: School Statistics. Available at: <http://www.avma.org/careforanimals/animatedjourneys/aboutvets/education.asp>. [cited: 2004, July 9].

Western University College of Veterinary Medicine. About the College. Available at: <http://www.westernu.edu/veterinary/about.xml> [cited: 2004, July 9].

AVMA Council on Education, Accreditation Policies and Procedures. August 1996.

AVMA Directory. Schaumburg, Illinois: American Veterinary Medical Association, 1998.

Center for Information Management, American Veterinary Medical Association, The U.S. Livestock Market for Veterinary Medical Services and Products. Schaumburg, Illinois: American Veterinary Medical Association, 1995.

Center for Information Management, American Veterinary Medical Association, U.S. Pet Ownership and Demographics Source Book. Schaumburg, Illinois: American Veterinary Medical Association, 1997.

Center for Information Management, American Veterinary Medical Association, Veterinary Demographic Annual Reports, Volume 5, Part 1: Demographic Distribution and Employment Trends in the U.S. Veterinary Medical Profession. Schaumburg, Illinois: American Veterinary Medical Association, 1996.

Center for Information Management, American Veterinary Medical Association, Veterinary Demographic Annual Reports, Volume 5, Part 2: Demographic Distribution and Employment Trends in the U.S. Veterinary Medical Profession by Primary Employment. Schaumburg, Illinois: American Veterinary Medical Association, 1996.

Center for Information Management, American Veterinary Medical Association, Veterinary Demographic Annual Reports, Volume 5, Part 4: Demographic Distribution and Employment Trends in the U.S. Veterinary Medical Profession by State. Schaumburg, Illinois: American Veterinary Medical Association, 1996.

Kass, Philip A. *Veterinary Medicine in California: Demographics, Trends and Educational Opportunities*, UCD, Davis, 1998.

The Pew National Veterinary Education Program, *Future Directions for Veterinary Medicine*. December 1988.

Pritchard and Stone. *Healthy America: Practitioners for 2005. A Beginning Dialogue for U.S. Schools of Veterinary Medicine. A report of the Pew Health Professions Commission*. 1991.

State of California, California Agriculture Resource Directory, 1997.

State of California, Consumer Affairs Information Services: California Board of Veterinary Medical Examiners, 1997.

State of California, Projected Total Population of California Counties: 1990 to 2040, Report 93.

P-3. Sacramento, California, May 1993.

State of California, Department of Education, A Master Plan for Higher Education in California 1960-1975. Sacramento, 1960.

State of California, Department of Finance, Interim County Population Projections: Estimated July 1, 1996 and Projections for 2000, 2010, and 2020. Sacramento, 1997.

United States Census Bureau, State Rankings, Doctors Per 100,000 Civilian Population, in 1996 Statistical Abstract of the United States, 1998.

United States Census Bureau, State Resident Population, in USA Statistics in Brief, 1998.

Western Dairyman, April 1998, and California Milk Advisory Board (personal communication)

Western University of Health Sciences, Veterinary Medicine Task Force Report. 1997.

