

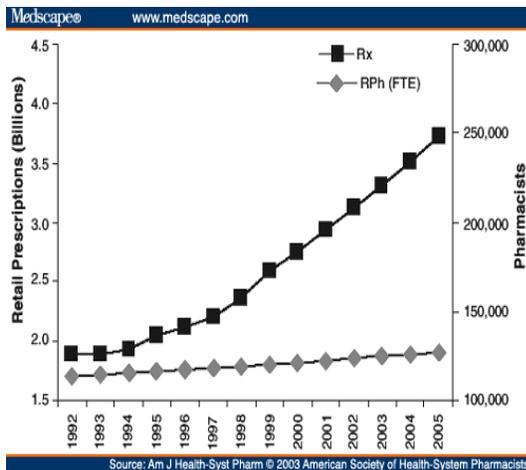
# PHARMACY EDUCATION AND THE UNIVERSITY OF CALIFORNIA

## Final Report of the Health Sciences Committee -- April 2004

### BACKGROUND

Across the nation, people are living longer. This longevity is attributable to healthier lifestyles, a well-trained health workforce, advances in science and understanding of human health and disease, and continuing discovery of new therapies for managing acute and chronic conditions. As the population ages, however, its interaction with the health care system increases. Larger patient populations in general, and increasing numbers with chronic diseases in particular, contribute to rapidly rising demands for health providers and facilities that must stretch to meet growing needs.

Within the pharmacy workforce, evidence of this demand is seen in the dramatic increase in prescriptions written and dispensed in the United States. During the 1990s alone, the number of retail prescriptions dispensed increased by 44%, from 1.9 billion in 1992 to almost 2.8 billion in 1999. By 2005, this number is expected to increase to approximately 3.7 billion prescriptions.



Among the factors fueling this growth are development of new medications and drug therapies, identification of new uses for existing medications, increased numbers of authorized prescribers, broader insurance coverage for some medications, and direct marketing to the public by pharmaceutical companies. Not surprisingly, this growth has generated a corresponding demand for pharmacists in hospitals and clinics, as well as in retail, government, and academic settings. Because growth of the workforce has not kept pace with the demand for services – due in part to the lack of growth in educational opportunities – a nationwide pharmacist shortage has developed. In California, this shortage is significant and well documented in chain store pharmacies, hospital practices, and other clinical settings.

This report examines state and national pharmacy workforce projections; provides commentary on the scope of practice for licensed pharmacists; reviews educational programs, application and enrollment trends, and pharmacy licensure requirements in California; and presents findings and recommendations regarding future steps the University of California (UC) might take in addressing current and projected state needs with respect to the pharmacy workforce.

# THE PHARMACY WORKFORCE

## Current Estimates and Needs

Pharmacists represent the third largest health professional group in the U.S. In 2000, there were 196,000 working pharmacists and an estimated 250,000 pharmacy technicians in the U.S. workforce. This corresponds to a national average of 65.9 pharmacists per 100,000 population. According to the Health Resources and Services Administration (HRSA), the total number of pharmacists in the U.S. is expected to increase by 28,500 (14%) over the next decade.

Measured against expected population growth and the average age of the population, however, there is a growing imbalance between the current number of licensed pharmacists and the requisite number to meet population needs. The exponential growth in the number of unfilled positions for both full-time and part-time pharmacists is a result of the rapid rise in demand for services and the nation's inability, to date, to increase its supply of practicing professionals. These shortages are well documented in chain store pharmacies (see Appendix A, Exhibit 1), hospital practices, and other clinical settings.

In California, pharmacy workforce shortages are significant and growing. The Aggregate Demand Index (ADI) – Pharmacy Manpower Project ([www.pharmacymanpower.com/index/html](http://www.pharmacymanpower.com/index/html)) ranks California, Minnesota, Wisconsin, Iowa, and Kentucky as the five states with greatest unmet demand (see Appendix A, Exhibit 2). In 1998, 16,770 pharmacists and 16,600 pharmacy technicians and aides served approximately 32 million Californians. This ratio of 51.3 pharmacists and 51.0 pharmacy technicians per 100,000 population ranks California 48<sup>th</sup> and 41<sup>st</sup>, respectively, among all the states in the nation.

## Factors Driving Workforce Demand

Population growth and changing demographics – including the aging of the population and diversity of its citizenry – are among the factors contributing to California's ongoing shortages of pharmacists. Other factors increasing workforce demand include:

### *Expanding Pharmaceutical and Biotechnology Industries*

Biotechnology companies and an advanced technology sector located near universities and research centers continue to draw the pharmaceutical industry to California. Leaders such as Pfizer, Johnson & Johnson, Merck, and Novartis have large research and development sites in La Jolla. Amgen and Allergan are in Thousand Oaks and Irvine, and Genentech and Roche maintain primary facilities in the San Francisco Bay area. The San Francisco and San Diego areas now support the nation's first and third largest biotechnology communities. As these businesses mature, and as approved investigational new drugs and clinical trials become critical to product lines, demand for pharmacy graduates in this sector will increase. Activities devoted to developing, producing, and assessing the clinical application of pharmaceuticals stimulate state and local economies and generate new demands for PharmD and PhD expertise in the pharmaceutical sciences. The breadth of knowledge and advanced skills of California graduates are considered well suited to – and highly desirable by – this industry.

### *Wider Scope of Pharmacy Practice*

The expanding scope of practice for licensed pharmacists has resulted in increased educational requirements for students and increased responsibilities for practitioners. Pharmacists participate actively in drug monitoring and disease management, multidisciplinary clinical care, and patient education. As members of clinical care teams, their expertise extends to advising patients and prescribers with regard to potential drug/drug and drug/disease interactions and the changes in management of chronic and acute illnesses. As the number and types of medications grow and the needs of patients increase, pharmacists report longer work hours, reduced flexibility in scheduling, and insufficient time to perform the range of tasks for which they are trained and accountable. Fatigue and frustration due to increased workloads, as well as concerns about the potential for adverse drug interactions and unintentional errors, are among the hazards cited by some professionals.

### *The Need for Cultural Competence*

Nationwide, the majority of pharmacists are white, followed most closely by Asian-Pacific Islanders. Based on the profile of recipients of PharmD and baccalaureate degrees conferred in 2001-2002, this profile is likely to continue (Appendix B). These data show a lack of diversity in the pharmacy profession, which is not unlike that seen for many health professions. In California, these data differ only slightly. In 2002, the majority of the state's pharmacy graduates were Asian-Pacific Islander American (63%), followed by non-Hispanic whites (26%). The California Census Bureau, however, reports that the majority of Californians are white (47%) and that the state's next largest ethnic group is of Hispanic or Latino origin (32%). The profile of California's pharmacy workforce thus differs greatly from that of its residents.

The relative lack of diversity among U.S. and California health providers, together with growing evidence of health disparities among various ethnic and racial groups, underscores the need for new and continuing efforts to increase diversity and improve the cultural and linguistic competency of all health professionals. By educating and training culturally competent faculty and practicing pharmacists, California's medically underserved groups and communities are likely to have improved access to pharmaceutical counseling and management services, and in turn to benefit by improved health outcomes. These issues are particularly critical for California's rural populations, many who live in designated Health Professions Shortage Areas.

In October 2000, the Ad Hoc Committee on Affirmative Action and Diversity of the American Association of Colleges of Pharmacy recognized and endorsed the societal benefit of diversity in pharmaceutical education, stating that "Every pharmaceutical educational institution in the United States, regardless of its mission, has a responsibility to build diversity in its student body and cultural competence into its curriculum." To assist pharmacy programs in achieving greater diversity and improved cultural competence, the report included recommendations ranging from the identification of best practices in outreach and recruitment, to instilling values of multiculturalism, tolerance, and professionalism, to supporting underrepresented students in graduate studies and other professional activities that will enhance their preparation for careers in academia and industry.

## **Factors Affecting Workforce Supply**

The supply of licensed pharmacists in California has been restricted by revised standards for licensure and the state's rigorous pharmacy licensing examination. Automated dispensing and refilling systems and the complementary workplace role of pharmacy technicians have not had a significant impact on reducing the state's need for licensed pharmacists.

### *Revised Standards for Licensure*

Until the 1990s, a Bachelor of Science (B.S.) degree from an accredited school of pharmacy was the minimum educational requirement for licensure. The B.S. degree was considered sufficient preparation for the North American Pharmacist Licensure Examination (NAPLEX) -- the standard licensing exam in all states except California. Only 17 of the nation's 72 schools offered the PharmD degree. By contrast, all California schools have offered the PharmD degree following tacit agreement among schools in the 1960s-1970s to prepare students for a level of expertise beyond drug information and product dispensing. As a result, California's pharmacy education programs broadened to include training in the appropriate use of drugs in patients, therapeutic counseling, and the use of drug and genetic information.

In the late 1980s and early 1990s, the pharmacy profession adopted "pharmaceutical care" as its philosophy. In 2000, the American Council on Pharmaceutical Education (ACPE) announced that it would accredit only PharmD programs. The NAPLEX was updated and the PharmD was established as the required entry-level degree for practice in all 50 states.

### *California's Pharmacy Licensing Examination*

Until January 1, 2004, California's state-specific licensure examination, which all pharmacy graduates were required to take -- including those previously licensed in other states -- served as an additional barrier to in-migration of pharmacists trained outside of California. The rigor of California's Bureau of Pharmacy licensing examination is reflected in the recorded scores of its applicants. Among graduates of California programs in 2002, first time pass rates for in-state graduates was 75%, while the pass rate of out-of-state graduates taking the California examination was only 32%. By contrast, the national pass rate for NAPLEX in 2002 was 94%.

To reduce this barrier, and in recognition of increasing pharmacy workforce needs, the California Legislature passed Senate Bill 361 in September 2003. This legislation directs the California Board of Pharmacy to license as a pharmacist those applicants who have passed a written and practical examination given by the Board prior to December 31, 2003, or who pass the NAPLEX on or after January 1, 2004 [SEC. 8., Section 4200 of the Business and Professions Code]. In addition to the NAPLEX, applicants for California licensure must also pass the Multi-State Pharmacy Jurisprudence Examination for California. While the effects of this change on the California workforce will not be known for some time, the move to adopt the national licensure examination is considered useful from a variety of educational, licensure, and employment perspectives.

Notwithstanding this change, it is important to note that international graduates of pharmacy schools, like foreign medical school graduates, face additional barriers to achieving U.S. licensure. Difficulties with language, knowledge of specific U.S. pharmacopoeia, limited transfer of educational credits, and other obstacles reduce opportunities for foreign-trained graduates to enter the workforce.

### *Automation and Technologic Advances*

Automated, computerized refilling and robotic dispensing systems have proved reliable in helping pharmacists with dispensing medications. The use of electronic prescribing software increases the time available to pharmacists for health education, drug monitoring, and patient care, and can reduce the incidence of medical errors created by illegibly written prescription orders. Despite early predictions, however, these automated environments have not decreased the number of pharmacists and work hours needed to oversee prescription management and monitoring (California Workforce Initiative, 2002). In addition, anticipated new costs, restrictive legislation, and greater applicability to large health facilities than to small facilities have limited the adoption of automation and technology on a widespread basis.

### *Pharmacy Technicians in the Workplace*

Well-trained and certified pharmacy technicians assist pharmacists with prescription dispensing and other tasks. When paired in required technician/pharmacist ratios (2:1 in hospital settings, and either 1:1 or 2:1 in retail settings, depending on the number of pharmacists on duty), pharmacists have greater opportunity to perform the professional and patient-oriented duties for which they are specifically trained. The skill set of pharmacy technicians is variable, however, because for many years they received only on-the-job training. The establishment of formal and comprehensive pharmacy technician training programs, and the introduction of a certification examination by the Pharmacy Technician Certification Board, are leading to an increasingly qualified and competent workforce of allied professionals.

## **PHARMACY EDUCATION**

Nationally, there are 87 colleges and schools of pharmacy with accredited professional degree programs. Among these, 31 are offered by private institutions and 56 are in publicly supported universities. In fall 2003, 85 colleges and schools offered the PharmD degree as a first professional degree; 45 offered the PharmD as a post-B.S. degree; and 66 offered other graduate programs in the pharmaceutical sciences (e.g., Masters and/or Ph.D. degrees).

The professional pharmacy curriculum is designed to produce pharmacists who have the abilities and skills to provide drug information, education, and pharmaceutical care to patients; manage the pharmacy and its medication distribution and control systems; and promote public health. Required coursework for all pharmacy students includes pharmaceutical chemistry; pharmaceutics (drug dosage forms, delivery, and disposition in the human body pharmacology; therapeutics (the clinical use of drugs and dietary supplements in patients); drug information and analysis; pharmacy administration (including pharmacy law, bioethics, health systems, pharmacoeconomics, medical informatics); clinical skills (physical assessment, patient counseling, drug therapy monitoring for appropriate selection, dose, effect, interactions, use); and clinical pharmacy practice in pharmacies, industry, health maintenance organizations, hospital wards, and ambulatory care clinics.

### **Application and Enrollment Trends**

The number of applications for admission to accredited U.S. schools of pharmacy has risen rapidly within the last three years, from a 9.1% increase between 2000 and 2001, to a 24.6% increase in 2002, and a substantial 41.7% in 2003. From September 2002 through August 2003, 47,306 applications were

submitted to first professional degree programs – equivalent to 4.8 applications for each entering student in fall 2003. Total first professional degree enrollments increased 10.7 percent from fall 2002.

### Pharmacy Education in California

In California, two UC campuses and four private universities offer pharmacy degree programs. Approximately 2,400 students are currently enrolled at UC San Francisco, UC San Diego, Loma Linda University, Western University of the Health Sciences (WUHS), University of Southern California, and University of the Pacific. The number of first-year positions at California schools ranges from 25-30 students at UC San Diego’s new School of Pharmacy, to a high of 200 at the University of the Pacific (see Appendix C). With plans to increase enrollments at Loma Linda University and the UCSD campus, and maintain enrollments at other schools, California will contribute an estimated 4,500 new graduates to the pharmacy workforce by 2010. Despite this gain, the total number of pharmacists is still expected to fall short of both the national average and the number needed to meet state needs based on population growth and health care utilization trends.

Reflecting national trends, the number of qualified applicants to California’s pharmacy programs exceeds the number of available positions (see Table 1). Although increases in educational opportunities have occurred over the past several years, the number of applicants for all programs continues to be substantial.

**Table 1. Total Applicants to California PharmD Programs\* vs. Total First-Year Positions in 2004**

	Loma Linda University	UC San Francisco	UC San Diego	University of Southern California	Western University	University of the Pacific
Applications	475	1236	1071	1300	1053	1875
Positions	55	122	30	185	120	200

\*Unduplicated data available as of October 2004.

By contrast to increasing national enrollment trends, and despite increasing numbers of highly qualified applicants to UC programs, total enrollment at UCSF has remained steady, ranging from 476 to 481 students across all years of the educational program. Although UCSD’s new program will enroll only 30 new students in its fall 2004 class, a record 1,071 students applied. In both UC schools, the majority of enrollees are women. However, the percentage of all enrolled students from underrepresented minority groups in California (including Black/African-Americans, American Indian and Alaskan Natives, and Mexican Americans) is less than 10% (43 of 477) at UCSF and less than 4% (2 of 51) at UCSD.

## ***Strengths of UC Schools of Pharmacy***

**Interdisciplinary educational programs.** In response to scientific advances and expanding professional standards, UC pharmacy programs have increased their academic and degree offerings and developed new areas of study to address changes in pharmacy practice and to meet changing accreditation requirements for advanced level pharmacy training.

- At UCSF, major changes began in the 1970s with a required fourth year clerkship designed to prepare students for the expanded role of the pharmacist as a member of the clinical care team. Students combine required and elective courses (e.g., chemotherapy and clinical oncology, pediatric and women's health issues, and clinical toxicology) and complete *advanced pharmacy practice experiences*, involving applied learning in acute, ambulatory, long-term care, and community care settings alongside physicians and nurses.
- The UCSF School of Pharmacy has recently revamped its professional curriculum to allow students to emphasize one of three areas: pharmaceutical care, pharmaceutical health policy and management, or pharmaceutical sciences. It has also launched joint degree programs (PharmD/MPH, PharmD/PhD) and new graduate offerings in interdisciplinary fields such as chemistry and chemical biology, pharmaceutical sciences and pharmacogenomics; and biological and medical informatics by initiating and establishing collaborations with research colleagues beyond the UC community (e.g., California Poison Control Center, Center for Consumer Self Care, Center for Chemical Screening and Diversity, California Institute for Quantitative Biomedical Research).
- At the new UCSD School of Pharmacy and Pharmaceutical Sciences, pharmacy students take many basic sciences courses with UCSD medical students and develop a common fund of knowledge in several preclinical science subjects during their first and second years. Following a year of distinct coursework and training specific to each profession, pharmacy and medical students return to share common clinical experience at UCSD hospitals and clinics during their advanced pharmacy practice experiences and clinical service rotations, respectively.
- In 2005, UCSD will launch a new Pharm.D.-Ph.D. program and a Pharm.D./M.B.A. program with its new School of Management.

**Preparation of future 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. Although advanced training among the faculty is regarded as both desirable and valuable for maintaining high educational and professional standards, only UC and USC currently offer accredited pharmacy residency and fellowship training program.

**Advanced-level clinical training for practicing pharmacists.** UC's accredited pharmacy residency and fellowship training programs yield qualified graduates who fill critical roles in the pharmacy workforce. Completion of a residency program is a requirement for inpatient pharmacy practice at UC and other academic health centers, and it a preferred qualification for pharmacists holding leadership positions at UC.

**Professional preparation of industry leaders and researchers.** UC's broad-based curriculum and advanced degree offerings prepare future leaders in both clinical practice and investigational research.

By opening the UCSD School of Pharmacy, UC demonstrated its ongoing commitment to secure and ensure growth of the pharmacy workforce and to develop a full educational site in southern California's growing biotechnology and pharmaceutical research sector.

### ***Ongoing Challenges for UC Pharmacy Programs***

**Required resources for accredited PharmD training programs.** The allocation of funding for UC's pharmacy educational and advanced-level training opportunities has not kept pace with the increasing requirements of pharmacy education. In 1970, support for faculty instruction was calculated at a ratio deemed sufficient to ensure the quality of the training offered at UCSF. Thirty years later, the same level of funding does not provide the resources needed to support a dramatically changed educational paradigm that requires small group, problem-based learning and mentoring, and clinical training, nor does it recognize the needs of a high-caliber graduate program. UC faculty must stretch to meet the demands of the field's widened scope of practice, broadened training and licensure requirements, and resulting changes in the pharmacy curriculum. Current budget constraints, together with increasing accreditation requirements and the inability to cross-subsidize, may prevent UC from increasing pharmacy educational opportunities, responding to workforce needs, and realizing opportunities for growth in the size and breadth of pharmacy education and research programs at UCSD and UCSF.

**Residency and fellowship training opportunities.** The number of advanced-level pharmacy training opportunities in California is considered neither adequate for meeting employment needs nor able to accommodate the number of qualified applicants. According to the American Society of Health System Pharmacists, which accredits the largest share of the nation's residency programs, applications to U.S. pharmacy residency programs have outnumbered available positions for the last nine years. At UCSF, nearly 50% of pharmacy graduates choose to pursue postgraduate training. Currently, however, the UCSF School of Pharmacy has only 19 clinical pharmacy residency positions (12 first-year positions) and 69 sponsored research fellowships (primarily PhD postdoctoral candidates).

**Faculty training, recruitment, and retention.** Without an adequate supply of faculty to support the courses, programs, and research endeavors that are central elements of pharmacy education and pharmaceutical science, programs training practicing pharmacists, researchers, and industry leaders will be limited in their capacity to meet changing demands. Effective recruitment strategies and expansion of residency and fellowship training opportunities will help draw future pharmacy faculty to UC schools for training. Promoting faculty development and analyzing funding requirements and resources available to support quality teaching and research programs will be essential for planning, as well as for successful recruitment and retention of faculty to meet the needs of existing programs.

## **SUMMARY OF FINDINGS**

- (1) California's demand for pharmacists far outweighs its supply.** In California, factors contributing to increasing workforce demand include the rapid growth in the number of prescriptions written and dispensed; increases in the size, aging, and diversity of the state's population; growth in the pharmaceutical and biotechnology industries; significant increases in the number of new pharmacies opening annually, and, a wider scope of practice. Individuals with pharmacy training are being asked to assume new roles as therapeutic advisors for patients with chronic diseases, key professionals in generating therapeutic formularies and pharmacoeconomic principles, and critical players in a drug development process that extends from discovery of new agents to post-marketing surveillance for efficacy. Contemporary and increasingly detailed training is

needed to meet the demands of an expanding pharmaceutical industry and the therapeutic sophistication of contemporary pharmacy and medical practices.

- (2) Growth in pharmacy educational opportunities in California, and particularly within UC, has not kept pace with either educational demand or workforce needs.** During the early and mid-1990s, several major factors limited the state's ability to increase its supply of pharmacists – including the absence of growth in pharmacy educational opportunities and limited opportunities to train clinical pharmacists and pharmacy faculty. Until January 1, 2004, restrictive state-specific licensure requirements added further barriers for out-of-state graduates. Since 1998, Western University of the Health Sciences and Loma Linda University have opened new schools, resulting in a combined increase of 175 new first-year positions at private institutions, or a nearly 35% increase in total first-year positions. The new School of Pharmacy at UCSD admitted 25 new students in Fall 2002, marking the first increase in PharmD education in the UC system in more than 20 years. UCSD anticipates the admission of 30 new students in Fall of 2005 and is planning further expansion to 60 students by 2006.
- (3) California faces a shortage of well-qualified faculty to train future pharmacists.** An adequate supply of well-trained faculty is essential for meeting pharmacy workforce needs and maintaining high standards in education and practice. UC needs to retain current faculty at UCSF and UCSD and to increase the number of faculty if any enrollment growth occurs. It is important to emphasize, however, that in recent years, the recruitment of pharmacy faculty has become increasingly difficult. Salaries offered in the private sector continue to climb as demand for pharmacists and pharmaceutical scientists increases, making recruitment more difficult, particularly as state funding for public higher education is reduced.
- (4) The pharmacy workforce shortage disproportionately affects the quality of care delivered to vulnerable populations and rural areas of California.** The shortfall of well-trained pharmacists is acute in rural and some urban areas of the state. Establishing educational links to clinics and practices in underserved areas would expand clinical training opportunities, improve health care delivery locally, and offer opportunities to recruit qualified students from medically underserved communities who may be more likely to return and practice in those communities.
- (5) Disparities in health status, changing demographics, and the role of pharmacists in health care delivery require increased diversity and cultural competency of the workforce.** As the cultural and ethnic diversity of the population increases, pharmacists must add cultural competence to their skill set in order to effectively deliver high-quality health care. For California's diverse patient populations, professional counseling and communication by pharmacists with both pharmaceutical expertise and cultural and linguistic competency contributes substantially to patient satisfaction and the quality of care provided.

## RECOMMENDATIONS

In the face of the ongoing pharmacist workforce shortage, increasing demands of California's growing and aging population, and the expanding scope of pharmacy practice, the Health Sciences Committee offers the following recommendations:

**(1) UC should expand educational opportunities in its Schools of Pharmacy by:**

- Increasing enrollment at UCSD from 60 first-year students (the number presently authorized, but not yet enrolled) to 70 per year;
- Increasing enrollment at UCSF from 115 first-year students to up to 140 per year; and
- Examining opportunities for development of new joint training programs with UCSF and UCSD, and/or creation of new joint pharmacy programs with other UC health professions campuses.

**(2) UC should increase the diversity and cultural competency of its faculty and students by:**

- Reviewing and adopting best practices in educational outreach and recruitment;
- Developing and promoting efforts to instill values of multiculturalism, tolerance, and professionalism; and
- Supporting underrepresented pharmacy students in graduate studies and other activities to enhance their preparation for careers in academia and industry.

**(3) UC should support efforts to address current and future needs for faculty by:**

- Increasing the number of first-year residency training and fellowship opportunities by at least 50% at both campuses. Growth of UC postgraduate training opportunities will both expand opportunities to train future faculty and increase access to advanced training for UCSF and UCSD graduates;
- Identifying opportunities for collaboration and resource sharing among training programs and public and non-profit institutions (e.g., by expanding satellite training sites and increasing outreach efforts); and
- Implementing effective recruitment and professional development strategies to recruit and retain outstanding faculty.

**(4) UC should continue to support a research-intensive and clinically active faculty base by:**

- Encouraging UC faculty to not only carry out teaching responsibilities, but also to pursue scholarly activity, including development of innovative programs that enhance drug discovery and development, improve therapeutic outcomes, and expand the role of the practicing pharmacist as a therapeutic consultant in the health care team; and

- Recognizing and supporting faculty contributions to these important programs that frequently serve as an economic wellspring and educational resource in pharmaceutical sciences and biotechnology in California.

**(5) UC should contribute to increasing the number of pharmacists practicing in underserved areas by:**

- Recruiting students from underserved communities throughout the state and supporting efforts to improve preclinical sciences education in these settings; and
- Developing new clinical training programs at sites in medically underserved areas (e.g., UCSF-Fresno, where a satellite training program is being developed).

## Appendix A

**Exhibit 1. National Association of Chain Drug Stores Survey, 1998-2000**

Date	Estimated Number of Unfilled Positions		
	Full-time	Part-time	Total
Feb 1998	2160	510	2670
Aug 1998	2862	648	3510
Feb 1999	3453	1024	4477
Aug 1999	4679	1263	5942
Feb 2000	5971	949	6920

Source: National Association of Chain Drug Stores (NACDS) Surveys, 1998 – 2000

**Exhibit 2. Aggregate Demand Index – Pharmacy Manpower Project**

Mean, Maximum, and Minimum Pharmacist Demand Levels for the Five States with the Highest Demand Levels in the United States				
State	Census 2000 Population	Pharmacist Demand On a Scale of 1-5 (See Demand Category Interpretation below)		
		Mean Rating	Maximum Rating	Minimum Rating
Minnesota	4,725,419	4.8	5.0	4.4
California	32,666,550	4.7	4.9	4.2
Wisconsin	5,223,500	4.6	5.0	4.0
Iowa	2,862,447	4.5	5.0	3.5
Kentucky	3,936,499	4.5	4.9	4.0

\*Source: Pharmacy Manpower Project, 2000

### Demand categories

- 5 = High demand: difficult to fill open positions
- 4 = Moderate demand: some difficulty filling open positions
- 3 = Demand in balance with supply
- 2 = Demand is less than the pharmacist supply available
- 1 = Demand is much less than the pharmacist supply available

## Appendix B

### Profile of US Recipients of PharmD and Baccalaureate Degrees in 2001-2002

Ethnicity	Pharmacy Degree Recipients		US Population Total
	PharmD	Baccalaureate	
White	61.1%	61.4%	75%
Asian-Pacific Islander	22.0%	21.3%	5%
Hispanic/Latino	6.5%	3.4%	13%
African American	4.3%	8.3%	12%
American Indian	1.1%	0.5%	0.9%

## Appendix C

California Schools of Pharmacy														
PharmD Degrees Conferred							Estimated PharmD Graduates							
School	City	1997-98	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
University of California, San Francisco	San Francisco	106	106	106	106	115	115	115	115	115	115	115	115	115
University of Southern California	Los Angeles	183	164	151	163	168	175	175	175	175	175	175	175	175
University of the Pacific	Stockton	202	203	201	208	208	200	200	200	200	200	200	200	200
Western University	Pomona	1 <sup>st</sup> class admitted 1998				95	100	100	100	100	100	100	100	100
Loma Linda University	Loma Linda	1 <sup>st</sup> Class admitted 2002					-	-	-	-	35	40	50	60
University of California, San Diego	La Jolla	1 <sup>st</sup> Class admitted 2002					-	-	-	-	25	25	30	60
<b>Total Graduates/Year</b>		491	473	458	477	586	590	590	590	590	650	660	680	710
<b>Estimated Percent Increase from 2000-01 graduating classes</b>							<b>23%</b>	<b>23%</b>	<b>23%</b>	<b>23%</b>	<b>36%</b>	<b>38%</b>	<b>43%</b>	<b>49%</b>

Source: The American Association of Colleges of Pharmacy (AACP), 2003 and personal communication with Loma Linda School of Pharmacy, UCSD School of Pharmacy, Western University School of Pharmacy, and AACP.

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