

**California's Future:  
It Starts Here  
UC's Contributions to  
Economic Growth, Health, and Culture  
An Impact Study for  
The University of California  
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# **INTRODUCTION**



# The Role of Universities Today: Critical Partners in Economic Development and Global Competitiveness

*In a global environment in which prospects for economic growth now depend importantly on a country's capacity to develop and apply new technologies, our universities are envied around the world. If we are to remain preeminent in transforming knowledge into economic value, the U.S. system of higher education must remain the world's leader in generating scientific and technological breakthroughs and in preparing workers to meet the evolving demand for skilled labor.*

Alan Greenspan  
Chairman, U.S. Federal Reserve

*Few institutions have more to offer in propelling economic development on both a national and local basis than our nation's colleges and universities. As leading institutions in their communities, they are powerful drivers, technology centers, employers, developers, and investors.*

Richard M. Rosan  
Urban Land Institute

Universities lie at the heart of successful, leading economies around the world. The role of America's leading universities—perhaps best exemplified by the University of California—in yielding scientific knowledge, discovering breakthrough ideas, fostering innovations, seeding new companies and creating jobs and new streams of personal and corporate income is practically unparalleled in the world.

Most people think of our universities as places for higher education and basic research, and they have traditionally served those public functions. Today, however, they also encompass much more. The public is often unaware of many of a university's broader economic and social contributions to their community, its economy and their own prosperity and quality of life. The university's far-reaching activities touch virtually every aspect of our daily lives and the prosperity of the communities we live in.

Empirical evidence continues to flow to support our understanding of the crucial and growing roles that universities play in the economic vitality and competitiveness of their surrounding regions. Over the past five years, numerous research analyses and impact studies conducted across North America and in Europe have demonstrated the strategic role that well-resourced universities have on their regional economies.

Business leaders also recognize the essential contributions that universities make in providing their companies and their regional economies with a competitive advantage through highly skilled workers, advanced technology, unparalleled knowledge and practical know-how.

Publicly and privately, many business leaders have expressed concern over the perceived negative impacts of reduced commitments to our universities. Corporations don't often sound alarm bells over cutbacks in university budgets but recently several leaders have raised concerns at public forums. Business leaders in the information technology industry, for example, are quite concerned about the reduced expenditures in public R&D, which they perceive to be jeopardizing the industry's competitiveness. "If the U.S. cedes its leadership in IT there will not be a second chance," Microsoft CTO Craig Mundie recently warned.<sup>1</sup> Why are they so concerned? Because government spending "seeds" university spending on basic research that finds its way into commercial production—and consumer's homes—ahead of competing regions. Information technology is in turn critical to the competitiveness of virtually every other industry, whether it be aerospace, biotech or digital media.

There has been significant research on companies' motivations to move or to remain and expand in a region. Many studies and surveys confirm that although many factors play a role, two of the most important appear to be *access to a pool of specialized workers* and the ability to *benefit from knowledge spillovers from the concentration of research, innovation and specialization*.

As Californians, how can we capture the true value of training our friends and neighbors, those who will become our leading scientists and innovators tomorrow, those who will contribute lifetimes to research and innovation? How can we capture the value of fostering the next Intel or Chiron?

And just as importantly, how do we take stock of *the cost of the missed opportunity* of maintaining national and international leadership in such strategic industries as information technology, telecommunications and biomedicine—especially when we *will not get a "second chance"* if we cede our position?

How can we assess the costs of not properly funding the transfer of university technology today knowing that it will—as it has over the past few decades—yield a significant return to Californians through the discovery of new technologies and products that vastly improve our quality of life and sustain our state's economic growth?

How does a university do all that?

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<sup>1</sup> "Will the U.S. Fall Behind in Tech?" *Fortune.com*. Oct. 22, 2002.

## ***Universities as Knowledge Creators***

- Universities are the indispensable players in the advancement of scientific knowledge, which continuously seeds new generations of applied research, scientific breakthroughs and streams of new products that enhance our lives and strengthen our economy.
- Universities play a central and strategic role in educating and training the scientists, teachers, researchers, entrepreneurs and other skilled workers that fuel innovation in high technology and the knowledge industries that are the primary drivers of successful regional economies today and are predicted to be the drivers of the global economy well into the future.
- Universities, especially large ones like the University of California system, foster equity and “level the playing field” through the dissemination of knowledge and ideas by way of student education, faculty interactions, collaborations with industry, community outreach activities, and through a variety of virtual-world mechanisms such as online training, digital libraries, e-learning and telemedicine.

## ***Universities, Entrepreneurs and Competitive Businesses***

- Universities are *innovation accelerators*. Innovation centers around three ingredients: knowledge creators, knowledge, and knowledge diffusion and application—all three form the core of the activities of today’s leading universities. Talented people create the knowledge; universities diffuse that knowledge throughout society; and innovators and entrepreneurs, often in collaboration with universities, take advantage of these ideas and bring new products and services to market and into our homes and offices.
- Universities are *key players in the generation of entrepreneurs* who form start-ups and expand businesses, thus creating thousands of new jobs—often higher paying skilled jobs for local residents—and new income streams that catalyze further investment in the economy, which generates still more jobs, personal income and capital investment.
- Universities are the *conveyors of “seed money” for exploratory research*—a key ingredient to the acceleration of innovation and the development of new products and services that result in start-ups and spin-offs.
- Universities *generate new and applied scientific knowledge* that is needed and used by local high-tech companies to expand their businesses and maintain their competitiveness. University faculty and students are *an important source of technical expertise* for local firms and a significant source of productivity gains.
- Universities are important *purchasers of local products and services* and thus are a significant catalyst to the emergence and development of a local supply chain, including many small businesses.

## ***At the Forefront of Job Training and Re-skilling***

- Universities are often the unsung heroes of *on-the-job training for graduate students and interns* who can work on actual industry research and application thus providing necessary resources to industry while also refining their own skills and knowledge resulting in greater efficiencies and productivity upon graduation.
- Universities and their extension programs offer *accessible means to continually upgrade skills*, acquire industry-specific applied skills and learn new knowledge and skills for moving into better jobs or new careers.

In these ways, today's best universities mean so much more to their communities' future than just a place for smart kids and great scientists.



# The University of California: At the Heart of a Healthy, Economically Vibrant California

*California's economic rise is closely tied to the rise of its research universities. For decades, the research universities of California have led the nation in the creation of new knowledge and its application to pressing problems of the day. New industries have been invented, new products have been developed, and new medical techniques have been invented to both save lives and enhance their quality. We have continually expanded the frontiers of knowledge, and we have made an impact on the daily lives of all Californians.*

*Richard C. Atkinson  
President, University of California*

Given these strategic roles for American universities, it is clear that the University of California must surely contribute enormously to the state's economic vitality and the quality of life of Californians. This impact study, conducted during 2002, attempts to quantify some of UC's key contributions—the public benefits that shape every aspect of our daily lives and chart the course of the future of California's diverse communities.

## ***Creating Jobs, Generating Revenues***

- Nearly 370,000 California jobs in 2002 were dependent on UC expenditures.
- In 2002, the total impact of UC expenditures on Gross State Product was between \$14.29 billion and \$16.65 billion.
- The UC system generated between \$4.2 and \$4.9 billion in state and local government tax revenues in 2002.
- The federal dollars that UC brings into California will create more than 60,000 California jobs, and a Gross State Product impact of \$3.07 billion over the next decade.
- Long-range forecasts indicate that UC expenditures between 2002 and 2011 will result in approximately \$144 billion in Gross State Product, \$56 billion in California state and local government tax revenues, and more than 2.36 million jobs statewide.

## ***Essential to California's Most Important Industry Clusters***

*The University of California is a leading provider of talent, industry knowledge and applied research to all of California key industry clusters—the groups of related businesses that are most critical to the state's economic prosperity and growth:*

*aerospace, agriculture, bioscience, computers and semiconductors, information technology, telecommunications and digital media/entertainment.*

- UC developed, patented and released new varieties of fuel for California's \$767 million strawberry industry, which now grows berries year-round.
- More than 95% of the wine grapes grown for California's multi-billion-dollar wine industry come from planting stock certified by UC.
- UC Berkeley is *second in the nation in producing computer science Ph.Ds.*, the skilled workers who pioneer new technologies and new businesses.
- UC science and engineering graduates working in California's cluster-related fields *generated approximately \$887 million* in Gross Regional Product in 2002 and will generate about \$7.4 billion during the next decade (2002-11).

## ***A Key Source of Innovation and Entrepreneurs***

- Through UC R&D, California will realize *productivity gains estimated at \$5.2 billion* during 2002-11. This productivity boost will in turn support the creation of more than *104,000 jobs* in the state.
- From FY 1998-99 through 2000-01, UC campuses reported *more than 2,600 inventions* created with university resources. For the past nine consecutive years, UC has been the *nation's leading university in the number of patents* developed.
- *More than 160 companies* were founded on the basis of technology licensing agreements with the university, not to mention the many more companies founded by UC professors, students and alumni.
- The value and economic contribution of UC related start-ups and spin-offs are great. As an illustration, Chiron, Inktomi and Agility Communications—California-headquartered companies founded by UC graduates, had combined revenues exceeding \$1.2 billion in 2001.

## ***Improving Health and Quality of Life***

- As the *state's fifth-largest health care system*, UC provides an unmatched combination of integrated patient care, research and medical education.
- *More than two-thirds of all medical students in California are enrolled in UC medical schools and nearly half of all medical residents in the state are trained in UC-based and UC-affiliated programs.*
- In 2002, UCLA ranked fifth and UC San Francisco seventh in *U.S. News & World Report's* annual "America's Best Hospitals" survey—the only two California hospitals in the top 10 rankings.
- UC is the *largest single provider of certain specialty services and medical procedures*, including emergency medicine and trauma services. *UC's Davis, Irvine and San Diego medical centers are, in fact, the exclusive providers of comprehensive emergency services in their respective regions.* Furthermore,

UC is often the default EMS provider for patients who need but could not otherwise afford life-saving traumatic services.

- UC also improves the health of Californians through community outreach programs, health care clinics and technology initiatives. Many of these UC services focus on education, prevention and early intervention. UC San Diego, for example, is affiliated with more than 100 community-based health programs and clinics serving a broad demographic population.
- *The largest educational library system in the world*, UC has more than 100 libraries, serving faculty and students but also thousands of Californians who live and work beyond campus borders.
- UC is also home to dozens of museums, gardens, performing arts and sports venues that enrich the cultural and recreational life of communities across California. UC also takes the arts to our children, through programs like ArtsBridge, which operates from all of UC undergraduate campuses, that support young scholars in the arts, provides K-12 art classes and offers related curriculum development and training of local teachers. In 2001, UC ArtsBridge served nearly 24,000 students and 267 schools across the state.

### ***Return on the Investment in UC***

- For every \$1 in state-funded UC expenditures in FY 2000-01, UC spent an additional \$4.
- For every \$1 it spends in California's regional economies, UC generates a total of \$1.30.
- For every \$1 in state-funded R&D at UC in 2000-01, UC secured an additional \$2.63 in federal funding and \$1.26 in private support for research. Thus, for every \$1 in state-funded research, UC brought in an additional \$3.89 for research.
- UC medical schools attract more NIH funding than any other medical educational system in the country—nearly \$900 million in 2000 alone.

Considering UC's contributions across the board, it is no exaggeration to say that perhaps no other institution in the state benefits the quality of life of more Californians in every sphere of their daily life—learning, working, playing, living—than the University of California.

These impacts highlighted above point only to the *tangible* benefits to Californians by the university. The *intangible* benefits to the enhanced knowledge and skills, confidence, improved health and higher quality of life of Californians across the state are tremendous, even if immeasurable. The University of California is a crucial asset to California and at the forefront of its economic competitiveness.

***Truly, it all starts here.***





## Executive Summary

The University of California has had, and will certainly continue to have, significant impacts on the California economy. That is a given, considering the sheer size of the institution. Some of the impacts are obvious: the thousands of UC employees throughout the state and the wages and salaries they earn, the thousands of students and the even greater numbers of alumni. Other impacts, however, may be less evident, even if no less significant.

This report documents the impacts of the UC system on the California economy. Highlighted are the impacts that matter most to the state economy in the long-run: the impacts that have contributed to shaping the California economy, that have enabled the economy to grow over the years, and that are critical to the prospects for the economy in the future. Highlighted, too, are the many impacts whose connections to UC may not be evident at first but whose benefits are widely enjoyed by Californians.

UC's economic impacts were determined for this report by using quantitative as well as qualitative analyses. The quantitative analyses were conducted with the aid of a widely used regional economic forecasting model. The qualitative analyses are based on interviews of numerous people in key economic sectors and public institutions throughout the state. Details on analytical methodology are presented in a series of appendices.

The report has three volumes, respectively addressing (1) impacts on the growth of the California economy; (2) contributions to the improvement of public health and welfare in the state; and (3) impacts on the quality of life enjoyed by Californians.

## Volume 1. Economic Growth

Three types of economic impacts were analyzed to capture the overall contribution of the UC system to the California economy:

- *Spending impacts (direct and indirect)*—from university expenditures on employee wages, goods and services.
- *Education and workforce impacts*—from the production of well-educated graduates for the state workforce.
- *Technology impacts*—from the research and development work undertaken at UC campuses.

The education and workforce impacts and the technology impacts were analyzed with reference specifically to seven major industries that have been driving economic growth in the state:

- Aerospace
- Agriculture

- Biosciences
- Computers and semiconductors
- Information technology
- Telecommunications
- Media/entertainment

As explained in the report, these are the “export-oriented” industries present in force in California that draw wealth into the state by selling their goods and services outside state borders, driving the growth of the state economy across all sectors. More accurately, these are industry “clusters” consisting of export-oriented companies, the suppliers to these companies, and the public institutions, physical resources, and human resources tapped by these companies in common, are all concentrated in physical proximity. Companies that concentrate in industry clusters share resources and thereby achieve efficiencies that increase competitiveness, resulting in business success. That is why companies in a particular industry tend to concentrate in specific locations (think of Hollywood or Silicon Valley)—and why the most successful regional economies are characterized by the presence of robust industry clusters.

California’s economic growth in past decades can be attributed in good measure to the strength of its clusters in these seven industries. Together, these industries account only for a modest portion of total state employment, but they contribute disproportionately to the state’s economic growth, not only through their own growth, but also by the consequent generation of increased demand for goods and services produced by other California industries. Universities provide essential inputs to any industry cluster anywhere by producing the workforce for the industry, conducting research that can be commercialized into valuable products, and contributing to the quality of life that helps attract people and, in turn, companies to a location.

### ***Direct and Indirect Spending Impacts***

An institution for higher education and scientific research, UC is also an employer, a major purchaser of goods and services, and a powerful magnet for attracting financial capital into the state.

The approximately 114,000 full-time employees on UC campuses receive a total of about \$6.5 billion in salaries and wages. UC also injects money directly into the state economy by purchasing goods and services to meet university needs; in 2000-01, these expenditures totaled \$11.7 billion. UC’s more than 166,000 students also contribute to the state’s economy by spending on goods and services for themselves.

These numbers do not, however, capture the full economic impact of UC spending. The wages and salaries earned by UC employees are spent on goods and services that other California companies then provide, resulting in additional hiring and production in the state. The extent of these “indirect spending” impacts depends on

the extent to which companies in the state can supply the goods and services in demand. In a large and diversified economy like California's, companies in the state can meet much of the demand. The upper-limit (i.e., high-end) estimates in this analysis assumed 50% of UC expenditures are spent in California; the lower-limit (low-end) estimates assumed only 25% of expenditures remained within the state. On average, however, the conclusion drawn was that UC expenditures are increased by 30% when they enter the economy (a "1.3 multiplier").<sup>2</sup>

While UC receives significant financial support from the state, the university is also a magnet for external dollars, drawing in revenues from sources outside the state—especially the federal government—that eventually are reinvested and multiplied in the economy. The impacts of expenditures covered by funds UC attracted from outside the state, can be identified separately.

Figure ES-1 summarizes the conclusions of the analyses. (These conclusions are presented in the body of this report with specific reference to each UC campus.) To explain:

- Above and beyond the employees working at each campus, UC expenditures indirectly created at least 255,509 jobs statewide in 2002.
- Combined with direct employment (114,000 in 2002), that means **nearly 370,000 California jobs in 2002 were dependent on UC expenditures.**
- In 2002, **the total impact of UC expenditures on Gross State Product was between \$14.29 billion and \$16.65 billion.**
- With respect to fiscal impacts, in 2002 **UC campuses generated between \$4.2 and \$4.9 billion in state and local government tax revenues.**
- The federal monies UC brings into California will create over 60,000 California jobs, and a gross state product impact of \$3.07 billion, through 2011.
- Long-range upper-limit forecasts indicate that **UC expenditures in the 10-year period from 2002 through 2011 will result in approximately \$144 billion in Gross State Product, \$56 billion in California state and local government tax revenues, and over 2,300,000 jobs statewide.**

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<sup>2</sup> This conclusion was derived with the aid of a sophisticated and well-known economic forecasting model, REMI (developed by Regional Economic Models, Inc.). REMI simulations were also used to generate forecasts of economic impacts for the 10-year period of 2002 through 2011.



**Figure ES-1.**  
**UC Economic and Fiscal Impacts**  
*(Systemwide and Statewide)*

Assumptions	Expenditures	Real Gross State Product (GSP) Impact	Real Disposable Personal Income Impact	UC Impact on Total State & Local Tax Revenue	Jobs Supported in State
2002 Upper-limit	\$10.25 B	\$16.65 B	\$12.34 B	\$4.86 B	319,400
2002 Lower-limit	\$8.45 B	\$14.29 B	\$11.09 B	\$4.22 B	255,509
2002–2011 Federal Funded	\$5.89 B	\$3.07 B	\$1.87 B	\$823 M	60,635
2002–2011 Total	\$132 B	\$144 B	\$123 B	\$56.0 B	2,362,336

What would be the effect on California’s economy if the UC campuses simply ceased to exist? As indicated in Figure ES-2, more than \$120 billion would be lost if there were no UC campuses. That is an impressive number, but not a very likely scenario. A more plausible worst-case scenario is that UC expenditures remain frozen at current levels because of budget constraints, rather than increasing 3% annually as assumed in the impact estimates above. Taking the difference between the original growth simulation and the scenario where employment, procurement, and student enrollment remained flat, **flat growth would result in the loss of over 110,000 jobs and more than \$22 billion in gross product** over the 2002–11 period in California’s most-populous regions.

**Figure ES-2.**  
Economic Losses if Campus Spending Were Flat

Scenario	Total Real GRP Loss (2002–11)	Real Disposable Personal Income Loss (2002–11)	Employment Level vs. Baseline in 2011
Flat Growth	-\$18.2 billion	-\$16.8 billion	-62,040
No UC Campuses	-\$122.2 billion	-\$110.2 billion	-345,440

## ***Education and Workforce Impacts***

In today’s knowledge-based global economy where capital and jobs are mobile, the quality of the workforce is a crucial determinant of where economic activity occurs—and does not occur. Because there is a highly skilled pool of UC-trained scientists and engineers, key industry clusters in California have a competitive

advantage of those in competing regions elsewhere in the country and the world, benefiting the state economy.

Universities like UC contribute to building a high-quality workforce in a number of ways. Universities educate undergraduate and graduate students, many of whom go on to enter the California workforce. Universities also help upgrade the skills of the workforce by offering extension courses and degree programs for students who work, creating avenues for life-long learning. Universities are the training grounds for the next generation of teachers and researchers. Finally, by providing women and minorities with access to higher education, universities help enhance economic opportunity.

**Generating a Skilled Workforce.** UC helps educate and train students in the seven knowledge-intensive industries most critical to California's economy. Computer scientists and engineers in various disciplines are essential to the aerospace, computers and semiconductors, information technology, telecommunications, and media/entertainment industries. The biosciences industries depend on talent in health sciences and biological sciences. The agriculture industry requires expertise in agriculture and natural resources. UC enrollment—both undergraduate and graduate—is high in all these disciplines.

- Over the past five years, UC student enrollment in computer science and engineering has grown tremendously—by 60% among undergraduates to a total of 20,072 in 2001, and by 44% among graduates to a 2001 total of 5,865. ***UC Berkeley is second in the nation in producing computer science Ph.D.s.***
- Undergraduate enrollment in the biosciences declined 8% systemwide over the past five years, but enrollments rose steeply at UCLA and incrementally at UC Berkeley. (Generally, U.S. university enrollments in biosciences decline when enrollments in computer science and engineering rise.)
- Three UC campuses—Berkeley, Davis and Riverside—have degree programs in agriculture. In 2001, there were more than 2,900 undergraduates enrolled in UC agriculture programs and 876 graduate students. Over the past five years, undergraduate enrollments at Davis in particular climbed steeply; graduate enrollment across the campuses grew slightly.

**Economic Impacts of UC Graduates.** The economic impact of UC science and engineering graduates entering employment in the seven key industry clusters is substantial. In 2002, an estimated 3,719 UC undergraduates and graduates majoring in cluster-related disciplines will enter the California workforce in cluster-related fields. Their incomes will ultimately generate approximately \$887 million in Gross Regional Product (GRP). Between 2002 and 2011, that GRP contribution will be about \$7.4 billion.

These estimates assume that if UC did not produce these graduates, the jobs that they hold would not be filled by outsiders educated in other states. This is not an entirely accurate assumption, of course, but it is clear that many of the jobs in key industries are located in California precisely because advanced educational and research institutions do exist in the state.

**The Skill and Education Continuum.** Because technology and labor skill demands are changing rapidly, constant training, retraining, job-hopping and career transitions have become more common for the workforce. Career planners often cite skill-building as the best way to advance or enter into a new career. Continuing education programs offered through UC Extension, including post-secondary education as well as professional education, serve the needs of a broad population of Californians.

Each UC campus has an extension program offering non-credit, degree credit, professional credit, and certificate courses through off-campus satellite locations and in-company training programs. In total, UC Extension offers more than 17,000 courses each year with more than 400,000 course enrollments. Each campus' extension program tailors course offerings and academic levels to meet the needs of the surrounding community and economy. There are sizeable enrollments in fields related to California's key industry clusters, especially in information technology and science and engineering.

**Expanding Educational Access for Economic Opportunity.** Socio-economic mobility and income are highly correlated with a person's educational level. UC has played an important role in expanding opportunities for women and minorities. Women, for example, now account for 42% of UC undergraduates. Minority enrollments vary significantly by ethnicity. Although the presence of minority students on UC campuses is expanding for many ethnicities, some minority groups are still underrepresented in disciplines related to key industry clusters—particularly science and engineering and at graduate levels. But UC has opened many avenues to improve educational access.

One important avenue for improving minority access to a UC education is the community college system. A relatively large proportion of the community college students who transfer to UC campuses are minorities. In fall 2002, UC campuses accepted 80% of the transfer applicants from California community colleges, totaling 13,627 students. Transfer enrollments are expected to increase to 15,300 students by 2005-06, which will likely have a positive impact on UC minority enrollment.

## ***Technology Impacts***

UC research and development (R&D) activities contribute to the state's economic development by enhancing the productivity of labor and capital, i.e., what we produce with our work and with our money. Further, the transfer of technology and knowledge generated at UC campuses provides California firms with new commercializable technologies and generates spin-off and start-up companies.

**R&D Expenditures.** An estimated 7% of all R&D activity in California takes place at UC campuses. ***Through UC R&D, California will realize productivity gains estimated at \$5.2 billion over the 10-year period 2002-11.*** This boost in productivity will in turn support the creation of more than 104,000 jobs in the state. Moreover (according to UC's Office of Technology Transfer), more than 160

companies have already been founded on the basis of technology licensing agreements with the University of California.

UC research expenditures vary by campus and reflect the strengths of the regional economies of which they are a part. UC Davis and UC Riverside R&D expenditures are significantly concentrated in agriculture. UC San Francisco, UC San Diego and UCLA concentrate research in the biosciences. UC Santa Barbara has the highest share of research expenditures related to IT, followed by UC Berkeley.

**Productivity Gains through Innovation.** Research expenditures, like any other expenditure, have direct and indirect economic impacts. But they also have impacts by improving productivity through innovations that enhance the efficiency of labor and capital.

The analyses conducted for this report indicate that approximately 1.3% of the growth in California's Gross State Product over the next decade will be attributable to productivity gains resulting from UC research activities. ***Productivity gains derived through UC research will contribute an estimated \$5.2 billion to the growth in Gross State Product and create more than 104,000 new jobs between 2002 and 2011.***

**Innovation and Commercialization.** Universities have long been centers of basic research, but there are increasingly serving as important conduits for applied research with valuable commercial applications. More and more private firms have acknowledged the economic value of the UC system by contributing financial resources for research. For 2000-01, UC entered into more than 2,600 agreements with industry valued at more than \$216 million. Private-sector sources of funding for UC research have increased faster than any other source.

Some of the research collaborations between UC campuses and private enterprise have been deliberately cultivated through public-private partnerships. The four landmark California Institutes of Science and Innovation are excellent examples. These institutes were launched with state matching funds to foster economic growth through joint UC-industry research in biomedicine, nanotechnology, telecommunications, information technology, and other technologies. Many cutting-edge commercialization projects are in fields directly related to California's key industry clusters. For 2000-01, some of the largest R&D contracts were in IT, computers and semiconductors, agriculture, and the biosciences.

**UC Inventions.** UC is also an important generator of ideas and technologies. From 1998-99 through 2000-01, UC campuses reported more than 2,600 inventions created with university resources.

**UC Start-Ups.** As noted, more than 160 companies have been founded on the basis of technology licensing agreements with UC. An estimated 65% of these firms are in fields directly related to the bioscience cluster in particular. Not included in these figures are firms started by UC professors and graduate students (examples include Chiron, Inktomi and Agility Communications); anecdotal information suggests there are sizable numbers of such firms.

**UC and the Digital Media Industry.** UC's digital media initiatives illustrate the university's innovation and commercialization impacts. A wide range of California industries—from information technology, telecommunications, and e-commerce to health care to manufacturing and agriculture—have come to depend upon innovative applications of digital media technologies. ("Digital media" generally refers to the convergence of media, entertainment, and technology.) By attracting R&D investments, increasing business and research support, and helping build a skilled digital media workforce in the state, UC is advancing California's digital media industry. Already, more than 30% of the country's digital technology and media companies are based in California.

The Digital Media Innovation Program (DiMI), headquartered at UC Santa Barbara, is a systemwide research and technology transfer program, partnering researchers from the nine UC campuses and three UC-managed national laboratories with industry partners and other researchers in digital technology and digital media. DiMI is one part of UC's Industry-University Cooperative Research Program, which fosters research collaboration in basic and applied sciences and facilitates the transfer of knowledge and technology.

DiMI's impact is internationally recognized by industry and the research community. Together with its industry partners, DiMI has generated potential products, new protocols, improvements to existing technology, and a myriad of patents and licenses. Outcomes to date include the following:

- Creating and establishing standards for distributed computing platforms and applications through projects such as SETI@home, the experiment that developed the world's largest supercomputer.
- Defining new methods, applications, protocols, and tools for storing, indexing, retrieving, managing, distributing, displaying, projecting and protecting audio, video, and textual data.
- Creating, developing and deploying intelligent remote sensor and GIS systems for precision agriculture, environmental impact studies and ecosystem analyses.
- Solving critical problems such as traffic flow and control using predictive analysis, simulation systems, virtual environments and the remote deployment of robots to improve highway safety and decrease traffic congestion.

While other entities, including California universities such as Stanford, Caltech and Cal Poly, conduct digital research activities, *no other programs in California or elsewhere in the United States have matched DiMI's scope, its contributions to codifying digital media, or its contributions to digital technology collaboration and transfer.*

## Volume 2. Improving California's Health

The lives of most Californians are touched daily by the UC system's contributions to public health. These contributions extend well beyond the UC medical schools and hospitals—the largest health sciences system in the country. UC also contributes to public health, both within California and worldwide, by carrying out medical research and developing innovations in the diagnosis, treatment, and prevention of disease.

A healthful diet, with access to nutritious foods, goes hand-in-hand with disease prevention and medical treatment in fostering public health. Through a statewide network of researchers and educators, UC helps increase agricultural productivity, improve food quality and safety, promote more-healthful eating habits, and enhance environmental quality.

The beneficial impacts of the UC system on the health of Californians are best understood by considering some of the UC contributions in each of the following interrelated areas.

### ***Food, Nutrition and Agriculture Impacts***

California's agriculture industry accounts for 1.1 million jobs and more than \$60 billion in personal income within the state. California farmers and ranchers generated \$27.2 billion in gross cash receipts in 2000, producing more than half of the nation's fruits, nuts, and vegetables. In fact, California has been the United States' number one agricultural state every year since 1948. California is also the country's leader in agricultural exports, shipping more than \$6.5 billion in food and agricultural products around the world. Agriculture is clearly one of the key industry clusters driving California's economy.

Much of the success of the agriculture industry in California can be traced to the influence of UC's research and extension programs. UC conducts agricultural, nutrition, and environmental research in more than 50 departments within the university system and more than 30 research centers and facilities across the state. California's farmers and ranchers have applied UC-derived knowledge and innovations to achieve a steady record of economic growth over the past half century while implementing management and production practices that make their operations the most environmentally-compatible, natural-resources-conscious, and occupationally safe in the counties they serve.

How good an investment is UC's agricultural research? A recent study by the UC Agricultural Issues Center concluded that the average annual internal rate of return for public investment in California agricultural research and extension from 1949 through 1985 was about 20%. During this period, farmers realized a 2.8-fold increase in output with only a 1.6-fold increase in inputs. The difference was attributed to productivity gains resulting from research and development, a substantial portion of which was conducted by UC. For example, California's \$767 million strawberry industry, which now grows berries year-round, relies on a steady stream of new varieties developed, patented, and released by the university. The



state's multi-billion-dollar wine industry also depends on UC research; more than 95% of the grapes grown in California come from rootstock that originated at UC Davis.

UC's impact on the state's agricultural production translates into more secure, wholesome, nutritious and safe food supply for Californians. As an example, the modern canning industry relies on the heat process developed in the 1920s by a UC bacteriologist to kill the organism that causes botulism. In 1992, UC researchers developed a method to screen chicken eggs for salmonella bacteria. A vaccine developed by scientists at the UC Davis School of Veterinary Medicine has, since 1989, significantly reduced the incidence of clinical mastitis in dairy cattle, in turn reducing the need for antibiotics, which ultimately has lowered the risk of antibiotic residues in dairy products.

Several UC campuses have also instituted public outreach programs to promote better (and more economical) nutritional habits, especially for low-income populations, as well as safer food handling and preparation techniques. UC outreach also works to improve the health of the state's food producers: UC conducts research and public outreach to promote farm worker occupational safety and health.

## ***Health Sciences Innovations***

The state's biosciences industry and health care system rely on the significant contribution of UC researchers. UC campuses generate strategic basic and applied health sciences research, moving innovative medical technologies one step closer to the public. UC has more than 230 specialized biosciences research centers and institutes at its nine campuses; of these, more than 150 are part of or affiliated with UC health sciences programs. Many of the UC's research discoveries and advances made at these centers and institutes are subsequently commercialized by California's biosciences industry leaders, tested in UC clinical research trials, and incorporated into the patient care delivery at UC medical centers and beyond. Made possible by UC laboratories, this innovation hub of UC researchers, industry, and UC medical centers is also facilitating immediate access for Californians to the most-advanced and effective medical treatments and technologies.

A good indication of UC's health sciences national reputation and "research efficiency" is its share of National Institutes of Health (NIH) research funding. UC medical schools attract more NIH funding than any other medical educational system in the country—nearly \$900 million in 2000 alone. This \$900 million is a crucial investment in research in California. By contrast, the next largest university system recipient received less than half of the UC share. UC San Francisco receives more NIH and non-NIH medical contracts and grants than any other medical institution in the country—38% and 40% of the respective national totals. UC medical discoveries and inventions that became indispensable to medical practice worldwide include the Positron Emission Tomography (PET) scan, which visualizes metabolic changes in the brain and body, and the isolation of the insulin gene, which led to the mass-production of genetically engineered insulin.

## ***Training California's Health Care Professionals***

California's health care system depends on having a reliable supply of qualified personnel, particularly the physicians and nurses who staff medical facilities and deliver essential patient-care services throughout the state. UC, as would be expected, is a critical training ground for the state's health care workforce.

***Operating the largest health sciences education and training program in the country, UC has more than 12,000 students enrolled in medicine, nursing, pharmacy, optometry, public health, and other health professional schools. More than two-thirds of all medical students in California are enrolled in UC medical schools and nearly half of all residents in the state are trained in UC-based and UC-affiliated programs.*** With an extensive patient care and health care outreach system, UC also provides an important clinical infrastructure for the education and training of the state's medical students and residents.

UC's role in training California's health care professionals is becoming even more crucial because California is growing faster than the rate at which it is training doctors and nurses—and already lags behind other states in terms of *per capita* medical education capacity. California cannot now accommodate the majority of applicants to its medical schools, even those well-qualified and preferring to study in the state. UC has to be able to maintain the same levels of health care enrollment, at a minimum, if the quality of California's health care system is to be sustained in the future.

UC's role in residency training is particularly important in this context because while health care professionals need not remain in the state where they are trained, characteristically ***about 70% of physicians in California residency programs remain in the state to practice.*** UC has more than twice as many residency graduates annually as medical school graduates. UC mounts a variety of programs (e.g., UC Davis' telemedicine operations) to encourage physicians to serve populations presently under-represented in the physician workforce, such as Latinos and African-Americans, and to practice in under-represented locations, especially rural inland areas.

## ***Caring for Patients***

The UC system has a major impact on the delivery of health care services in California. As the state's largest university hospital system and the fifth largest health care delivery system, UC provides an unparalleled dimension of integrated patient-care, research, and education. The eight licensed general acute care and two licensed acute psychiatric hospitals at the five UC medical centers provide primary care and more than 150 areas of specialty care medicine. Including residents, nurses, technicians and health administrators, UC has more than 18,800 health care professionals and staff. UC's medical centers also extend their services through off-site community-based offices, affiliations with non-UC medical facilities, and regional physician's networks, which link physicians to UC specialists.



The quality of patient care provided by UC medical centers is confirmed by numerous national and statewide honors. For example, UC's medical centers at Los Angeles and San Francisco consistently rank among the top medical centers in the nation. In 2002, UCLA ranked fifth and UCSF seventh in the *U.S. News & World Report* annual "America's Best Hospitals" survey. UCLA and UCSF were the only two California hospitals in its top 10 rankings.

Hospital capacity is an issue of growing importance to California's health care system because changing demographics—especially the aging of the population—are raising hospital utilization and decreasing the availability of resources. UC provides an important source of capacity for Californians' health care needs: in FY2000, UC had a total licensed bed capacity of 3,313. Among UC's capacity, the system houses vital emergency medical services (EMS) and advanced specialty/surgical care services determined that:

- UC is the largest single provider of certain niche areas in emergency medicine, including trauma services. UC's Davis, Irvine and San Diego medical centers are, in fact, the exclusive providers of comprehensive emergency services in their respective regions. Further, UC is the default EMS provider for patients who need life-saving traumatic services but cannot pay; and
- UC is often the only source for very difficult specialty procedures, and consistently has its medical centers ranked among the top hospitals nationwide for various specialty surgery areas. Compared to other hospitals in the state, UC has an above average Case Mix Index, indicating the relatively higher complexity of its services and severity of its patients' conditions. Special centers and programs at UC's medical centers (e.g., for diabetes and burn treatment) also combine research and patient care components, making an impact on the lives of those especially in need of the most specialized services and the highest quality of care.

### ***Expanding Access: Community Health Programs***

Beyond the medical centers' premises, UC health professionals and students are implementing important services into the day-to-day routine of health care. UC maintains and improves the health of Californians through community outreach projects, health care clinics, and technology initiatives. UC San Diego, for example, is affiliated with more than 100 community-based health programs and clinics serving a broad demographic population. Many of these programs focus on education, prevention, and early intervention.

UC community health programs give particular attention to populations that have difficulty accessing basic affordable health care, characteristically low-income families and, especially, Latino and African-American families. These programs often use innovative approaches to reach under-served populations. For example, the Pacific Asian Grocery Store Cancer Education Project used Asian grocery stores to disseminate information about cancer prevention to San Diego's Asian and Pacific Islander population. The UCLA School of Medicine sponsors and operates a number of free clinics, e.g., the American Indian Free Clinic, which offers a full range of

primary and family medical and dental services. The UCSF medical school, which coordinates the San Francisco Health Care for the Homeless Program, sponsors two homeless clinics in the city to reach homeless people in need of health care.

## Volume 3. Quality of Life Impacts: UC's Cultural Connections

As a premier institution of higher education, the University of California's wide spectrum of facilities and programs create a rich environment for student learning and discovery, however, UC campuses are also great public cultural resources. From the public use of UC's libraries, cultural venues, and recreational and athletic facilities to community participation in UC outreach and youth education programs, most Californians' lives are directly or indirectly affected by UC's cultural resources every day. Through campus programs, events, and public engagements, each UC campus provides its local community with a wealth of resources and amenities that might not otherwise be available.

In fact, through its cultural programs, recreational facilities, and community service activities, along with its health care services, UC contributes to improving practically every aspect of the daily lives of Californians. Considering UC's contributions across the board, it is no exaggeration to say that there is ***no other institution in the state that benefits the quality of life of all Californians in every sphere of their daily life—learning, working, playing, living—more than the University of California.***

While it is virtually impossible to quantify in monetary terms the total impact of such amenities on people's lives, their extensive public use is indicative of UC's "added value" in California—both on and off campus. For two other reasons, UC's cultural, recreational, and community services significantly benefit the state economy:

- These amenities enrich the physical and emotional life of Californians, helping to create a "sense of place" in their local communities, which strengthens bonds to the community and to California.
- These amenities also provide California with a strategic advantage in attracting and retaining the best and brightest of skilled workers. The kinds of cultural and recreational services made available to Californians by UC are highly valued by today's "creative class" (the term coined for the estimated 30% upwardly mobile sector of the U.S. workforce.)<sup>3</sup> Not surprisingly, local economies tend to flourish and grow where these people congregate. Without the contributions of UC campuses, the vibrant and distinctive personalities of their surrounding communities would undoubtedly be diminished.

The UC system's contributions to the quality of life Californians enjoy is best demonstrated by citing examples in a number of spheres.

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<sup>3</sup> See <http://www.washingtonmonthly.com/features/2001/0205.florida.html>.

**A Library for All Californians.** In addition to faculty and students, *UC libraries—the largest educational library system in the world—serve Californians who live and work outside campus borders.* In 2001, in fact, more than 15% of borrowing from UC libraries was by non-UC patrons. Moreover, library resources such as computers, databases, classes, and outreach programs are available to the public and widely used.

UC libraries have taken advantage of modern information technology to make their holdings even more accessible to the public. For example, the California Digital Library provides Internet-access to special collections and archival material, supplementing the physical collections. The Online Archive of California, part of the digital library, provides access to more than 6,000 collections of manuscripts and artwork in California; more than 92% of the searches of this archive have been by non-UC users. UC's online retrieval database (called "Melvyl") lists more than 10 million titles in UC libraries as well as a number of other California libraries. The CDL Searchlight enables users to search for holdings in libraries around the world in certain fields.

**Arts and Culture.** Complementing its departments in fine arts, architecture, music, literature, languages, and ethnic studies, UC is also home to a number of prominent museums and performing arts centers. Here local and internationally acclaimed visual artists, musicians, actors and authors can work and perform in facilities that are widely used not only by UC students and faculty, but also by the general public. Every UC campus mounts a wide variety of arts and lecture programs, musical events and special cultural events and programs.

**Community Outreach and Volunteerism.** UC campuses each support a variety of community, K-12 development, and youth outreach programs. Some programs are unique to an individual campus; others span multiple campuses. Two examples of systemwide programs have been widely acclaimed:

- ArtsBridge, a program operating at eight UC undergraduate campuses and several non-UC campuses, supports young scholars in arts disciplines, provides K-12 classes in the arts, and provides related curriculum development and training of local teachers. In 2001, UC ArtsBridge served nearly 24,000 students and 267 schools across the state.
- MESA (Math Engineering Science Achievement), which also operates at eight UC undergraduate campuses, is a statewide enrichment program in mathematics and the natural sciences geared towards disadvantaged students. MESA has received national awards as among the country's most innovative public programs. MESA serves more than 32,000 students annually.

The largest professional development enterprise in California's educational system, UC "teaches the teachers" through California Subject Matter Projects and California Professional Development Institutes, conducted intensive standards-based programs for more than 80,000 California teachers during 2000-01.

Volunteerism and public service are significant activities at all UC campuses. UC faculty, staff, and students volunteer in numerous UC and non-UC programs that are aimed at meeting local community interests and needs. UC Berkeley, for example, is home to the Cal Corps Public Service Center, which administers the campus' centralized student public service, leadership development, community development, and civic engagement programs. Cal Corps programs include K-12 reading programs, food banks, and outreach in areas such as recycling and civic awareness. In 2001-02, more than 2,500 UC students were involved in Cal Corps volunteer activities and more than 1,170 students were active in service groups.

**Athletics and Recreation.** In addition to attracting thousands of California residents to its NCAA sporting events, the UC campuses mount a variety of athletic and recreational outreach programs. Programs include year-round, on-campus recreational programs for youth and adult activities (such as camps and retreats), summer programs, adventure trips, and the use of facilities by businesses. Generally an extension of campus recreational and physical education departments' services, these programs allow the public to take advantage of state-of-the-art athletic facilities such as Olympic-sized swimming pools, dance studios, climbing facilities, and sporting fields that might not otherwise be available locally.

**Conference Services and Housing Facilities.** One of the UC system's greatest assets is its state-of-the-art, self-sustaining campus facilities. On-campus dining commons, residence halls, and conference services provide food and lodging for guests and residents. Stadiums, events centers, classrooms, lecture halls, and conference rooms are often available to the public year-round, especially during the summer. UC conference services and facilities make available comprehensive, modern, and more affordable alternatives to commercial services and spaces.

#### **UC Impact Reports on the Web**

A summary of this report, and a full copy of the report in PDF format, is available at [www.universityofcalifornia.edu/itstartshere](http://www.universityofcalifornia.edu/itstartshere).

The University of California campuses periodically conduct impact reports for their individual institutions. Those documents are generally available online at [www.universityofcalifornia.edu/economy/impactreports.html](http://www.universityofcalifornia.edu/economy/impactreports.html).

Additional information about UC's contributions is also provided at the systemwide web pages on UC and the economy, health, the environment and the community. [www.universityofcalifornia.edu](http://www.universityofcalifornia.edu).

**VOLUME I.**  
**ECONOMIC GROWTH**



## Volume I. Preface

The University of California plays a vital, multifaceted role in communities throughout the state. From making amazing scientific discoveries to creating new jobs and business growth, the UC system contributes in substantial ways to California's quality of life and significant economic benefits across the state. Given its sheer size, scale and breadth, UC is unique in the range of its contributions, and is an important economic actor at the state and regional levels. To capture UC's full economic contribution, three types of economic impacts have been analyzed in this report: direct and indirect spending effects, education and workforce impacts, and technology impacts.

Direct spending impacts include those benefits that are generated by the "day-to-day" operations of each UC campus. The number of university employees, their wages and salaries, the level of university expenditures on all other goods and services beyond its payroll, and the student population are all-important sources of economic activity. This direct spending stimulates additional production in regional economies, with demand rippling through the economy to generate more job growth and spending. This is what is known as a "multiplier effect," the process by which UC's economic activity creates "indirect" impacts.

The most recognized contribution UC makes to the economy is through its role in producing well-educated, skilled graduates. Improving the quality of the workforce is critical to economic innovation and productivity. UC graduates provide a high-quality source of skilled workers that power California's knowledge-based economy. UC also plays a critical role in producing a skilled workforce along the whole continuum of education and training: from K-12 preparation to college degree, to continuing education and the upgrading of professional skills.

Furthermore, UC is crucial to California's economy as a center of innovation and technology development. This trend was accelerated with the passage of the Bayh-Dole Act in 1980, which promoted the commercialization of technology in a wide array of institutions, including universities. Universities have emerged as vibrant centers of economic growth and have been instrumental to the success of some of the most dynamic regional economies in the world, not least of which include the Bay Area's Silicon Valley and the High Tech Coast of Southern California. Such impacts, while widely acknowledged, are seldom assessed quantitatively.

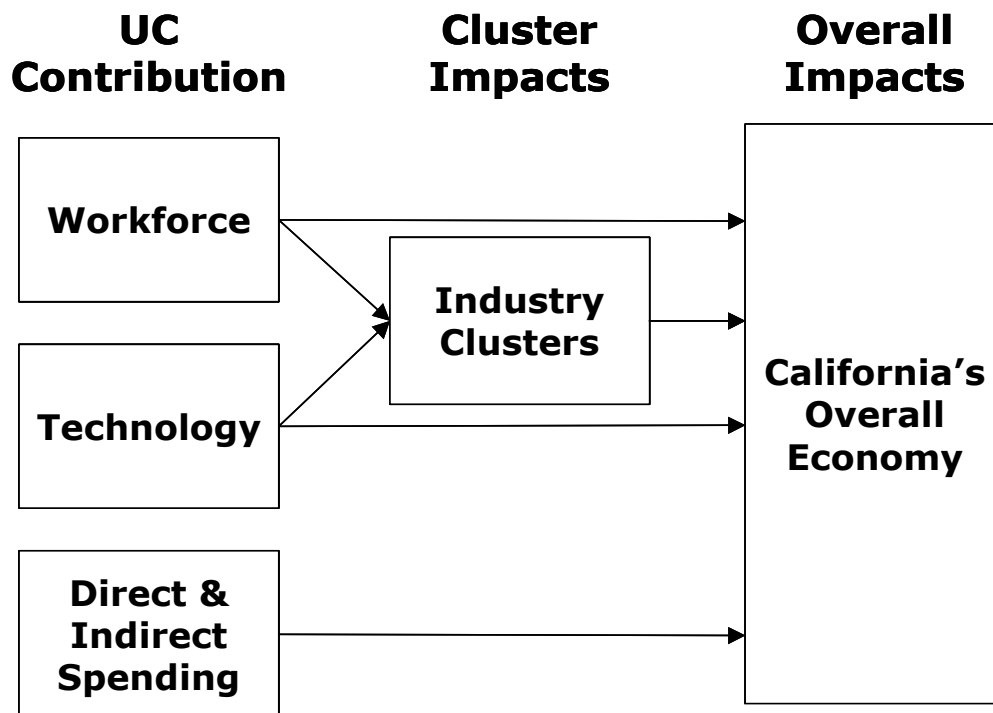
Analyzing these UC impacts from the perspective of industry clusters is useful for several reasons. California's economy is one of the most advanced economies in the world. The drivers behind the state's economic growth are the handful of fundamental industry sectors—what this report describes as "clusters"—that generate a substantial proportion of the revenues that are pulled in from outside the region or state as the result of products, technologies and services they "export." Few other states are endowed with such a dynamic set of industry clusters.

These key knowledge-intensive industry sectors provide a vital link between California’s economy and the University of California, for it is at this point where the state’s economic growth starts and where, not coincidentally, UC makes its most significant contributions to economic and social prosperity.

For these reasons, the analytic model used to assess UC’s impact on California’s economy focuses on the university’s contributions to the state’s economy directly or indirectly via economic “inputs” into these crucial industry clusters—UC spending, technology and workforce development. The following diagram illustrates this underlying approach, which is referred to throughout the analyses.

The economic chapters of this report discuss these three impacts to demonstrate the positive role that UC plays in California and its communities. The report’s findings rest on a veritable mountain of data and analysis—much of which has been included in the methodology and statistical appendices that follow Chapter 4.

**Figure I-i.  
Framework for Assessing UC’s Key Economic Impacts**





# 1. Key Industries for California's Economic Growth

## The Role of Industry Clusters

Technology and skilled workers do not in themselves produce direct economic impacts; they make their mark through industries, or more specifically, through companies. Graduates of prestigious UC engineering programs, for instance, get jobs in related fields and provide highly specialized expertise to businesses. If the industries are not in the region, however, the impact of specialized technologies and workforce resources will be dramatically reduced. Skilled graduates and workers will leave the region and find gainful employment in another area. It is the *interdependence* between resources, amenities and infrastructure that provide technology and workforce development—or “economic foundations”—and industries that create a dynamic of vigorous economic growth.

The groups of related businesses that matter most to economic prosperity and growth in regional economies are called *industry clusters*. An industry cluster refers to a network of companies—along with the suppliers and other institutions that share markets, labor pools and other specialized inputs—that generate a substantial proportion of the revenues that are pulled in from outside the region or state as the result of products, technologies and services they “export.” The close proximity and interrelationships among these competitors and complementary players produce internal efficiencies, increase cluster competitiveness and hence increase the competitiveness of the region in which they are located.

Because they are export-oriented, they tend to be highly concentrated in specific economic regions since their production serves national and/or international markets. In contrast to exclusively local-serving industries, industry clusters draw revenue into the regional economy and stimulate economic growth. In short, ***industry clusters are the drivers of economic growth***. Of course, local-serving industries, such as retail stores and neighborhood businesses, are also critical to regional economies. These businesses provide a very large share of a region's overall employment, but they alone cannot create new growth.

The growth of local-serving industries is usually dependent on external factors such as patterns of national growth or the performance of a region's industry clusters. By way of example, consider Silicon Valley. Today, Silicon Valley is filled with local businesses such as, movie theaters, restaurants, clothing stores and so forth. Just two decades ago, many of these newly created stores did not exist. They did not, however, come into existence through an economic process internal to the region; rather, they grew because of Silicon Valley's extensive interaction with the national and global economy, which drew in new revenue, enhanced the tax base and dramatically expanded consumer spending. Not coincidentally, Silicon Valley is perhaps the best example of a cluster-based regional economy—a fact that the region's leaders have recognized for at least a decade and have organized their cooperative economic development efforts around accordingly.

## 1. Key Industries for California's Economic Growth

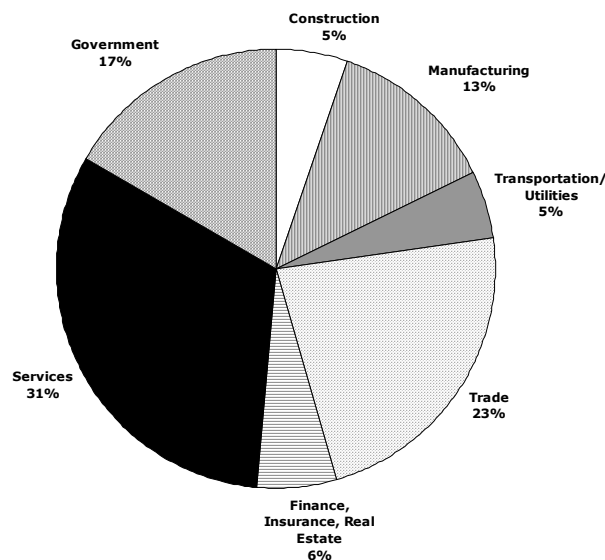
What enables industry clusters to export is the competitive advantage created through specialization and their ability to create efficiencies in the production process. Through its own effort, any individual company can create competitive export products, but firms have a big advantage if they are located in regions that provide them with useful inputs of goods and services. Locally located upstream and downstream linkages provide access to markets and specialized suppliers. Specialized research institutions, such as the University of California, may generate new commercially viable technologies and highly skilled workers. This dynamic interaction between related industries as well as other supporting institutions is the heart of an industry cluster.

Industry clusters have significant economic ripple effects throughout regional and statewide economies. They constitute only a modest portion of total employment but serve as economic engines for California and its regions by drawing in wealth from the exterior (through export earnings) and stimulating demand for services and quality of life amenities in the home region.

### California's Clusters

California's economy recently became the fifth largest in the world. The state's Gross State Product exceeded \$1.3 trillion in 2002, accounting for 13% of total U.S. output. Although California's economy is diverse (Figure 1-1), it is driven by knowledge-intensive industries. Advanced services have grown substantially, and manufacturing has moved into the production of higher income-generating businesses and consumer goods.

**Figure 1-1.**  
**Composition of California's Diverse Economy, 2001**



Source: Economy.com

How do the economic numbers for the future look? Between 2002 and 2011, economic forecasts for California estimate that the state's population growth rate

will rise by 0.77% annually. The forecasts also project an annual employment growth rate of nearly 1%, resulting in 21 million total jobs by 2011. California's Gross State Product is expected to grow by 3.25% a year, reaching \$1.65 trillion (in fixed 1992 dollars) by 2011. Over the same period, labor productivity is projected to increase by 2.34% annually. Furthermore, the average annual wage in California is expected to reach nearly \$50,000 in 2011.

Where does this growth start? The California economy has seven competitive clusters that are especially critical to this overall performance:

- Aerospace
- Agriculture
- Biosciences
- Computers and semiconductors
- Information technology
- Telecommunications
- Media/entertainment

These urban clusters (excluding agriculture) employed more than 1.4 million people in California in 2001. While representing only a small percentage of California's employment, these industry clusters—as California's "export" base—contribute disproportionately to the state's economic growth.

**Figure 1-2.**  
**Employment in California's Metropolitan Industry Clusters**

Industry Cluster	California Employment, 2001
Aerospace	87,000
Biosciences	217,000
Computers and Semiconductors	240,000
Media/Entertainment	386,000
Information Technology	290,000
Telecommunications	198,000
<b>Total</b>	<b>1,418,000</b>

Agriculture is a vital element of California's economy, supporting more than 1.1 million jobs in California, accounting for 7.4% of the state's total employment, and generating 6.6% (\$59 billion) of the state's total annual personal income, according to 1998 figures from the UC Agricultural Issues Center. Because the industry cluster analysis detailed in this chapter is based on employment levels measured by standard industrial classifications for metropolitan statistical areas, the analysis

looked primarily at urban regions. Data limitations are common for rural areas because of the difficulties in tracking employment levels there. In the economic modeling component of the analysis, agriculture is broadly captured under science and engineering labor and technology resources. The specific economic and health impacts of UC's role in California agriculture are covered in Chapter 5, "Food, Nutrition and Agriculture."

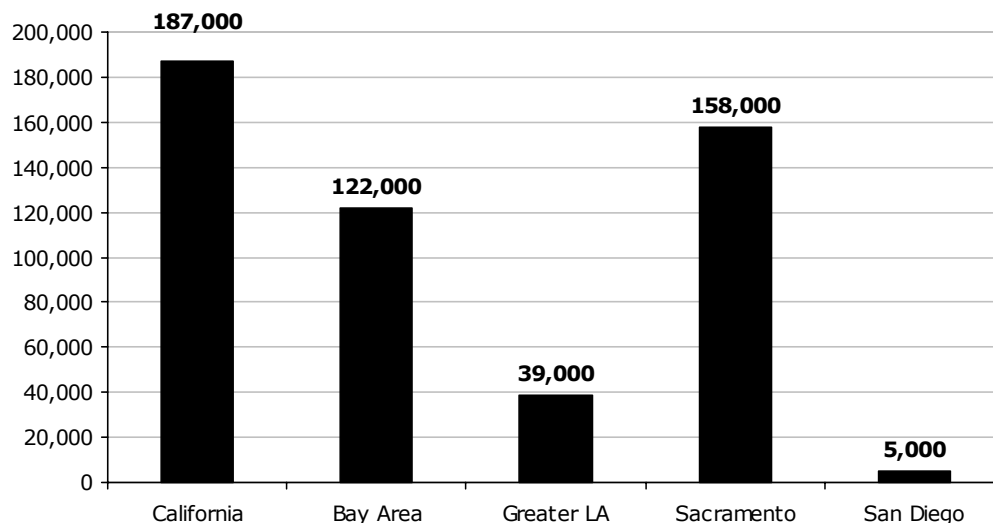
The media/entertainment cluster receives specific inputs from some UC campuses, but the relationship between UC and the cluster is not as well defined as it is for the other clusters emphasized in the analysis. Thus, the media/entertainment cluster was also not analyzed in this chapter. However, UC contributions to the media/entertainment cluster are assessed in the digital media-related section of the technology impact chapter. The cluster also absorbs UC graduates with engineering skill sets, as discussed in the education and workforce chapter. (See Appendix A for cluster-analysis methodology and Appendix F for detailed cluster-analysis charts and tables.)

### **Information Technology**

The information technology cluster, which is centered on computer software and other types of information services, created more than 180,000 jobs between 1991 and 2001 in California. In the Bay Area alone, the cluster's geographic center, the IT cluster created 122,000 jobs, accounting for 68% of the state's total IT growth.

California's major metropolitan economic regions—the Bay Area, Greater Los Angeles, Sacramento and San Diego—were benchmarked against the 41 largest metropolitan regions in the nation in terms of cluster employment levels, growth and location quotient, a measure of employment concentration relative to the national average. See Appendix F for detailed cluster analysis and benchmarking results.

**Figure 1-3.**  
**Change in IT Employment, 1991-2001**



In the Bay Area, the concentration of IT-related employment is more than 2.8 times greater than the national average. (The location quotient measures relative employment concentration in an industry. A location quotient higher than 1 suggests that the region has some kind of comparative advantage that is attracting specialized workers in a particular industry. See Appendix A for a description of how this statistic is calculated.)

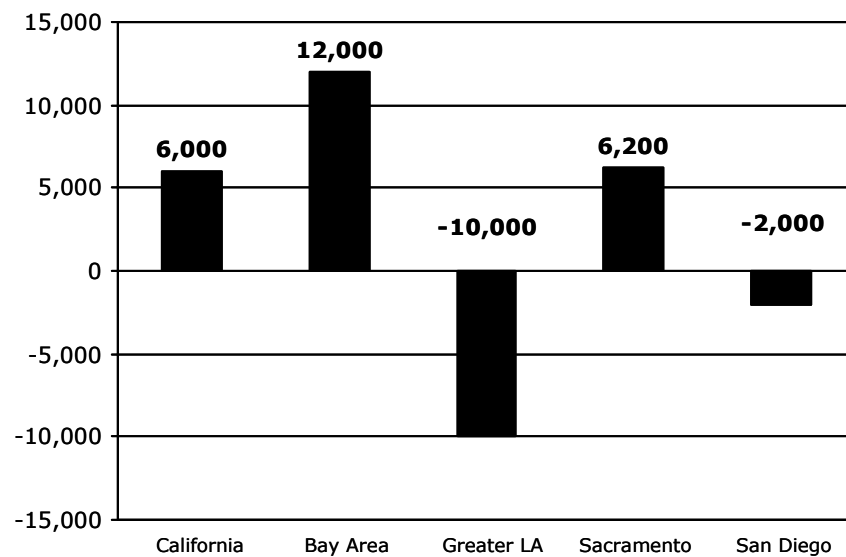
Compensation as well as productivity growth is also very high for the IT cluster. In the Bay Area, average annual pay exceeded \$167,000 (including bonuses, cash value of meals and lodging, tips, deferred contributions, and stock options). Productivity growth (measured as output per employee) has also been extremely brisk, rising 6% per year in the Bay Area. In the Greater LA, San Diego and Sacramento regions, IT average annual pay ranged between \$80,000 and \$90,000.

### ***Computers and Semiconductors***

The computer and semiconductor cluster is composed of the industries related to computers and related sub-components, such as peripherals, storage devices, semiconductors and circuit boards. In 2001, nearly a quarter of a million Californians employed in the computer and semiconductor industry cluster, and the state's major metropolitan regions—the Bay Area, San Diego, Greater Los Angeles and Sacramento—had a combined 2,117 business establishments in this category. As with the software-related IT cluster, the Bay Area is the clear leader both statewide and nationally. Cluster employment in the Bay Area is concentrated nearly five and one half times the national average. Only a couple of other regions across the country (Austin, Texas and Boise, Idaho) have concentrations that are higher, but in absolute terms, the Bay Area is much larger than these regions. Approximately 67% (1,108) of the Bay Area's total computer and semiconductor companies were located in Santa Clara County in 2001, and about 12,000 Bay Area jobs were created between 1991 and 2001.

Outside of the Bay Area, San Diego and Greater LA also have relatively high employment concentration in the computer and semiconductor cluster, but growth there has not been as dynamic. Indeed, in Southern California, the cluster has contracted due to declines in related aerospace industries and the transfer of production overseas. In Sacramento, by contrast, computer and semiconductor employment was very low—less than 6,000 people—but growth has been robust and reached nearly 12,000 in 2001. Cluster employment in the Sacramento region is now about 2.2 times as concentrated as the national average. Encouragingly, productivity growth has been strong both across all regions and sectors of this cluster, ranging from about **8% to nearly 25% annually**.

**Figure 1-4.**  
**Change in Computer and Semiconductor Employment, 1991-2001**



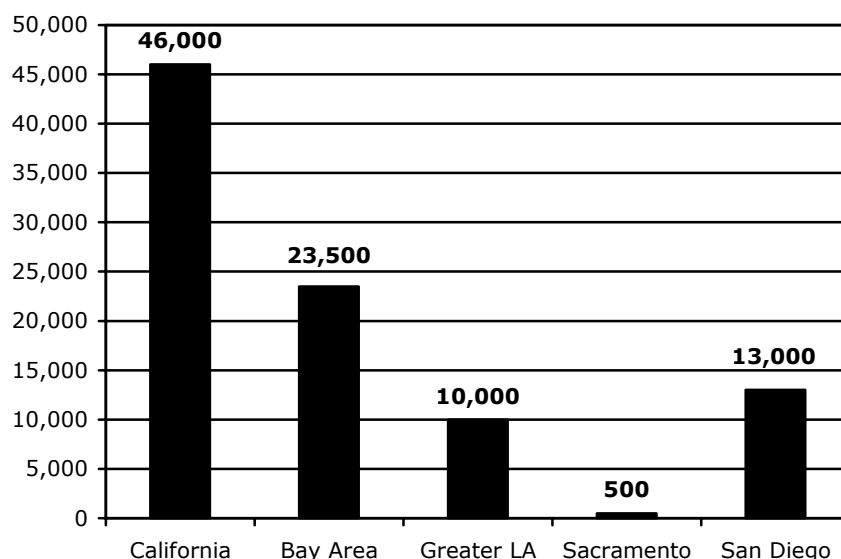
## ***Biosciences***

The biosciences are a diverse cluster that encompasses traditional pharmaceutical firms, specialized medical laboratory research and biomedical instrument manufacturing. The bioscience cluster has grown impressively over the last decade, adding approximately 16,000 new jobs in California. In 2001, the cluster employed 217,000 Californians.

A national leader in the biosciences, California is home to several of the most dynamic bioscience regions in the country—metropolitan San Diego, Greater LA and the Bay Area—which had a combined total of approximately 835 bioscience companies in 2001. The bioscience cluster has added jobs in all three regions, with growth particularly strong in San Diego and the Bay Area (Figure 1-5).

San Diego's concentration of employment in the biosciences is nearly five times the overall U.S. concentration in this cluster. The figures for the Bay Area (3.57) and Greater LA (2.11) are also impressive. The only other non-California regions competitive with San Diego or the Bay Area are Raleigh-Durham and Salt Lake City, but even these regions have much smaller bioscience clusters in absolute terms.

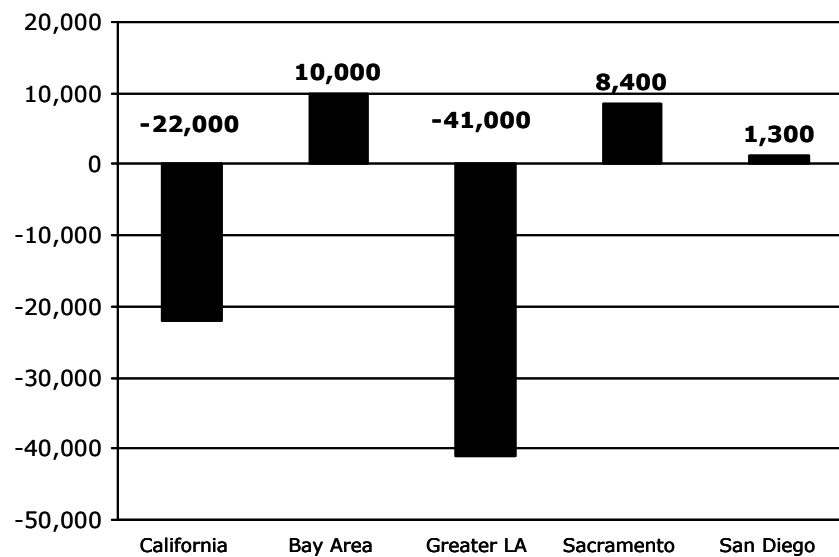
**Figure 1-5.  
Change in Bioscience Employment, 1991-2001**



### ***Telecommunications***

The telecommunications cluster includes communications equipment manufacturing as well as communication services. Statewide, the total number of jobs in this cluster has declined, with large employment losses in defense-related telecommunications in the Greater LA region dragging down the overall state average. But despite an overall loss of 22,000 jobs, there are several bright spots at the regional level. Bay Area, Sacramento and San Diego telecommunications have all experienced employment growth between 1991 and 2001. Labor productivity in telecommunications equipment manufacturing also exceeded 20% annually—an extremely rapid rate—in both San Diego and the Bay Area, which reflect advances in information technology. In 2001, there were 1,074 telecommunications businesses in San Diego and the Bay Area.

**Figure 1-6.**  
**Change in Telecommunications Employment, 1991-2001**



## Aerospace

The aerospace industry cluster, concentrated in Southern California, has a long history in the state. With approximately 362 business establishments in Greater LA and San Diego in 2001, the industry cluster has been a large exporter supplying aircraft parts and equipment, as well as missile and space technologies.

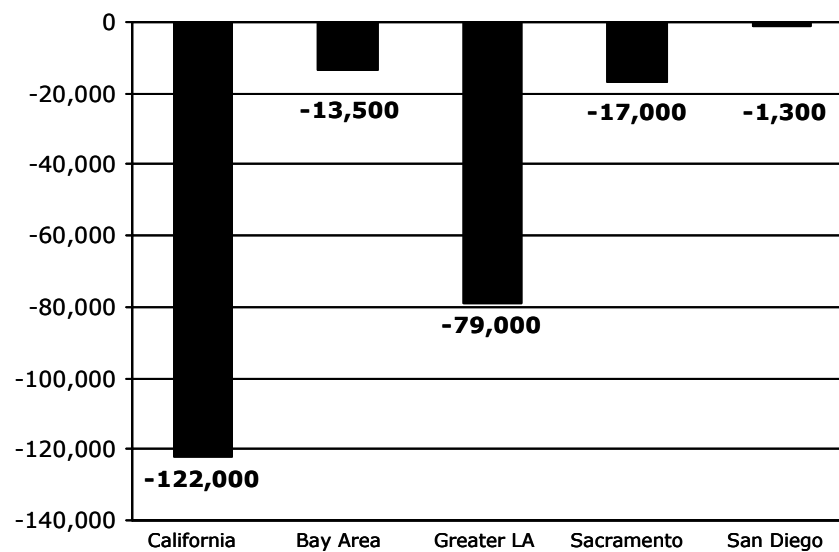
Nationally, the number of jobs in the aerospace cluster declined about 4% annually between 1991 and 2001. Much of that drop was felt in the Greater LA region, which lost 122,000 jobs over the last decade (Figure 1-7). Nonetheless, Southern California continues to have a relatively high level of concentration in the aerospace industry. Aerospace employs nearly 80,000 people in LA, and the region's employment is about 2.4 times more concentrated than the national average.

These downward trends have been driven largely by changes in military priorities. But as the September 11th terror attacks have dramatically shown, U.S. military priorities can change quickly; and just as military procurement can be curtailed, it can also be expanded.

Moreover, aerospace technologies—such as navigation, simulation and advanced materials—also have important dual-use, commercial applications that can have positive spillover effects for other high tech industry clusters. Another encouraging sign is that despite employment contraction, labor productivity across the aerospace cluster has increased by more than 6% annually.



**Figure 1-7.**  
**Change in Aerospace Employment, 1991-2001**





## 2. Direct and Indirect Spending Impacts

University of California campuses play a substantial role in the economic prosperity of communities in their surrounding regions and across the state. An institution for scientific research and higher education, UC is also an employer, a major purchaser of goods and services, and a magnet for investment, including bringing federal research dollars into the state. UC infuses a significant amount of economic vitality into the state through its direct expenditures, which then generate additional benefits indirectly by stimulating further demand for goods and services, resulting in incremental income, jobs and tax revenue for California.

### The Big Picture

This chapter analyzes the direct and indirect impacts that UC spending has on California's regional and statewide economies. Some of the highlights of this analysis:

- Beyond the employees working at each campus, UC expenditures indirectly created at least 255,509 new jobs across the state in 2002.
- Combining these jobs with the university's 114,000 employees (FTE), nearly 370,000 California jobs in 2002 were directly and indirectly dependent on UC expenditures. This figure represents more than 2% of all employment in California, and is larger than the *total* non-farm employment of four U.S. states—Alaska, North Dakota, Vermont and Wyoming.
- The statewide impact of the UC campuses on Gross State Product was between \$14.29 billion and \$16.65 billion in 2002. California's total Gross State Product was \$1.24 trillion in 2002, according to an estimate from Regional Economic Models, Inc. (REMI).
- UC campuses generated between \$4.2 billion and \$4.9 billion in state and local government tax revenues in 2002.
- Long-range forecasts indicate that UC expenditures from 2002 through 2011 will result in approximately \$144 billion in Gross State Product, \$56 billion in state and local government tax revenues, and 2.36 million new jobs statewide during that 10-year period.
- In a "worst-case" scenario where UC expenditures, student enrollment and employment levels remained flat over the next decade, there would be significant costs to California's economy. If UC levels remained flat, the Bay Area, Greater LA, San Diego and Central Valley regions would lose a total of 110,880 jobs and more than \$22 billion in combined Gross Regional Product from 2002 through 2011.

UC's employees receive about \$6.5 billion in annual salaries and wages. Through its non-wage expenditures, UC also injects money directly into the state economy through purchases that support university-related activities. In 2000-01, expenditures totaled \$11.7 billion. Of these non-wage expenditures, UC attracted

\$712 million from the federal government. UC received \$1.8 billion in total federal funds in 2000-01. (See Figures 2-2 through 2-10 for expenditures by campus and fund sources). Finally, students contribute to economic growth. UC's campuses are home to more than 166,000<sup>4</sup> students, whose spending also generates significant demand for services and goods. (UC's 10th campus, in Merced, is scheduled to open in 2005.)

This chapter presents the findings of a quantitative analysis of the magnitude of these economic impacts.

### Multiplier Effects

The aggregate numbers above do not capture UC's full economic impacts. "Multiplier effects," which represent the university's "indirect" impacts, also need to be taken into account. To understand how multiplier effects work, consider the following illustrative example. Wages and salaries create greater personal income, which in turn increases disposable income. This additional disposable income leads consumers to spend more, which in turn raises aggregate demand for goods and services. Growing consumer demand then leads companies to boost production, hire more workers and increase capital investment. Investment and more employment then trigger a new round of increases in overall demand. This process continues incrementally until it eventually tapers off. In the end, one new dollar of income will ripple through the economy and generate more than that first dollar of economic activity. This is in essence the multiplier effect.

The size of the multiplier depends on a number of factors. For instance, in a diversified and highly developed economy like California's, an institution's need for goods and services can be provided by companies in the state. Its expenditures then go to businesses within the same economy. These companies then buy goods and services from other firms in the state. As a result, more of the expenditures "stay in" the state. By way of contrast, consider a less developed economy that has little local production. A company or university there would have to import goods and services from outside its regional economy, and thus expenditures "leak out" of the area.

To analyze multiplier effects, we use a sophisticated econometric model, REMI (Regional Economic Models, Inc.). REMI takes into account all of these factors and generates estimates of specific multipliers, which were then used to estimate the impacts of wages and salaries, spending and other elements of the UC system on a variety of indicators reported below.

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<sup>4</sup> This figure encompasses full-time equivalent undergraduate and graduates students at UC's general campuses. Approximately 13,000 FTE students are also enrolled at UC professional health sciences programs; this additional figure would have a negligible effect upon this report's projected macroeconomic impacts.

## 2. Direct and Indirect Spending Impacts

The economic multipliers vary for each campus, but **on average, UC campus expenditures are amplified by 30% when they enter the economy.** This means that for every dollar that UC spent, \$1.30 in gross regional product was generated within the economy. The input-output coefficients in REMI are uniquely defined for each region based on the magnitude of economic

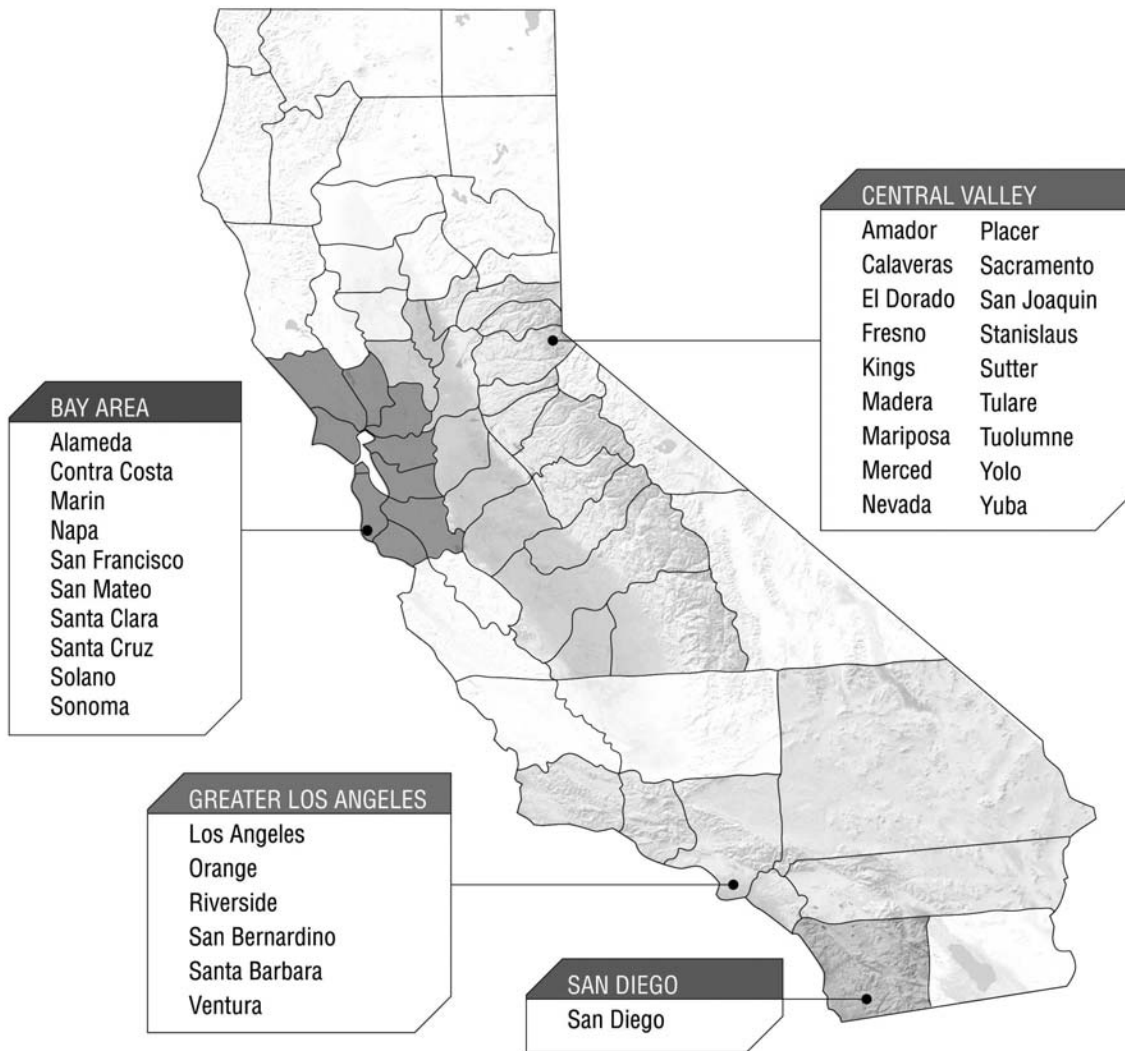
activity in various industrial sectors, including assumptions made about the spending patterns of various segments of the regional population. The baseline assumptions in REMI are indicated below. (See Appendix C for a description of REMI and more information on REMI baseline forecasts.)

The gross product multipliers for UC in the upper-limit regional scenario ranged from 1.03 to 1.65, and 1.06 to 1.75 in the lower-limit regional scenario, indicating that expenditures in the region have significant incremental impacts through business and consumer spending cycles. These figures are calculated by dividing the real Gross Regional Product impacts by campus expenditures. Moreover, each campus' expenditures are further amplified at the statewide level.

This report uses four regions for assessing the economic impacts of UC's nine existing campuses. The 10-county Bay Area's economy was used as a baseline to model the impacts of UC Berkeley, UC San Francisco and UC Santa Cruz. UCLA, UC Irvine, UC Riverside and UC Santa Barbara's impacts were modeled with the six-county Greater Los Angeles' economy as a baseline. San Diego County's economy was the baseline for UC San Diego, and the Central Valley's economy will be the baseline for UC Davis. (Appendix C lists the counties located in each of these regions; Appendix G provides baseline forecast data for each region.)

Therefore, the multipliers among UC campuses in one region differ from campuses in another region due to differences in these REMI regional coefficients. The campuses in larger metropolitan regions have greater average multiplier effects because they are located in areas with a higher magnitude of regional economic activity. Thus, campuses in the Greater LA region—UCLA, UC Riverside, UC Santa Barbara and UC Irvine—have the highest average multipliers, followed by those in the Bay Area. UC San Diego and UC Davis have smaller multipliers because they are located in regions with relatively smaller economic activity. However, it is more important to focus on the multiplier range than an absolute figure, which can only be an estimate at best.

**Figure 2-1.  
California Regions' County Composition**



## The REMI Simulations

To capture the total impacts of university spending, simulations were run using current wages and salaries of UC employees, non-wage expenditures and students to get a picture of today's indirect impacts, and on through to 2011 to establish a 10-year forecast of UC's future economic impacts. Actual 2000-01 levels from the university provided the basis of the projections through 2011. The following input values were used for each campus. (See Appendix C for the data sources and methodology used to project the 2002-11 levels.)

**Figure 2-2.**  
**UC Berkeley Spending Impact Inputs**

Item	2000-01 (Actual)	2011-12 (Projected)
Student Population	29,300	31,800
Personnel (Full-Time Equivalents)	12,969	14,913
Wages and Salaries	\$706,863,000	\$1,089,757,000
<i>Expenditures Other than Wages and Salaries*</i>		
From State and Local Government Sources	\$185,634,000	\$283,156,000
From Federal Government Sources	\$125,770,000	\$190,003,000
From Tuition, Endowment and Similar Funds, Private Gifts, Sales of Educational Activities/Medical Center, Other	\$436,528,000	\$665,857,000

*\* (2011-12 academic year) These numbers were deflated by a factor of 0.5 or 0.25 before the respective simulations were run. This holds for all campuses. See Appendix C for an explanation.*

**Figure 2-3.**  
**UC Davis Spending Impact Inputs**

Item	2000-01 (Actual)	2011-12 (Projected)
Student Population	22,700	26,290
Personnel (Full-Time Equivalents)	16,956	21,677
Wages and Salaries	\$883,736,000	\$1,509,468,000
<i>Expenditures Other than Wages and Salaries</i>		
From State and Local Government Sources	\$212,316,000	\$349,783,000
From Federal Government Sources	\$95,193,000	\$143,809,000
From Tuition, Endowment and Similar Funds, Private Gifts, Sales of Educational Activities/Medical Center, Other	\$741,398,000	\$1,221,428,000

**Figure 2-4.  
UC Irvine Spending Impact Inputs**

Item	2000-01 (Actual)	2011-12 (Projected)
Student Population	19,200	27,335
Personnel (Full-Time Equivalents)	9,681	16,436
Wages and Salaries	\$532,474,000	\$1,199,363,000
<i>Expenditures Other than Wages and Salaries</i>		
From State and Local Government Sources	\$98,858,000	\$208,061,000
From Federal Government Sources	\$56,079,000	\$118,026,000
From Tuition, Endowment and Similar Funds, Private Gifts, Sales of Educational Activities/Medical Center, Other	\$741,398,000	\$1,221,428,000

**Figure 2-5.  
UCLA Spending Impact Inputs**

Item	2000-01 (Actual)	2011-12 (Projected)
Student Population	30,000	32,900
Personnel (Full-Time Equivalents)	25,234	28,715
Wages and Salaries	\$1,457,790,000	\$2,223,391,000
<i>Expenditures Other than Wages and Salaries</i>		
From State and Local Government Sources	\$274,387,000	\$423,726,000
From Federal Government Sources	\$148,975,000	\$225,059,000
From Tuition, Endowment and Similar Funds, Private Gifts, Sales of Educational Activities/Medical Center, Other	\$1,418,637,000	\$2,190,755,000



## 2. Direct and Indirect Spending Impacts

**Figure 2-6.  
UC Riverside Spending Impact Inputs**

<b>Item</b>	<b>2000-01 (Actual)</b>	<b>2011-12 (Projected)</b>
Student Population	12,800	19,700
Personnel (Full-Time Equivalents)	3,833	6,834
Wages and Salaries	\$184,917,000	\$436,661,000
<i>Expenditures Other than Wages and Salaries</i>		
From State and Local Government Sources	\$71,762,000	\$165,667,000
From Federal Government Sources	\$23,816,000	\$54,981,000
From Tuition, Endowment and Similar Funds, Private Gifts, Sales of Educational Activities/Medical Center, Other	\$102,496,000	\$236,619,000

**Figure 2-7.  
UC San Diego Spending Impact Inputs**

<b>Item</b>	<b>2000-01 (Actual)</b>	<b>2011-12 (Projected)</b>
Student Population	19,300	27,485
Personnel (Full-Time Equivalents)	14,315	23,225
Wages and Salaries	\$725,070,000	\$1,561,381,000
<i>Expenditures Other than Wages and Salaries</i>		
From State and Local Government Sources	\$155,007,000	\$326,343,000
From Federal Government Sources	\$193,391,000	\$407,154,000
From Tuition, Endowment and Similar Funds, Private Gifts, Sales of Educational Activities/Medical Center, Other	\$652,163,000	\$1,373,025,000

**Figure 2-8.**  
**UC San Francisco Spending Impact Inputs**

Item	2000-01 (Actual)	2011-12 (Projected)
Student Population	3,717*	4,514**
Personnel (Full-Time Equivalents)	13,631	21,271
Wages and Salaries	\$880,881,000	\$1,826,055
<i>Expenditures Other than Wages and Salaries</i>		
From State and Local Government Sources	\$132,567	\$225,826
From Federal Government Sources	\$125,705	\$214,136
From Tuition, Endowment and Similar Funds, Private Gifts, Sales of Educational Activities/Medical Center, Other	\$769,140	\$1,310,216

Note: (\*) 1999-2000 figures (\*\*) Students and medical residents in long-range development plan.

**Figure 2-9.**  
**UC Santa Barbara Spending Impact Inputs**

Item	2000-01 (Actual)	2011-12 (Projected)
Student Population	19,600	21,900
Personnel (Full-Time Equivalents)	5,469	6,440
Wages and Salaries	\$260,108,000	\$410,133,000
<i>Expenditures Other than Wages and Salaries</i>		
From State and Local Government Sources	\$70,917,000	\$108,294,000
From Federal Government Sources	\$44,615,000	\$67,401,000
From Tuition, Endowment and Similar Funds, Private Gifts, Sales of Educational Activities/Medical Center, Other	\$170,686,000	\$260,646,000

**Figure 2-10.**  
**UC Santa Cruz Spending Impact Inputs**

Item	2000-01 (Actual)	2011-12 (Projected)
Student Population	12,500	16,785
Personnel (Full-Time Equivalents)	3,490	5,463
Wages and Salaries	\$171,640,000	\$357,318,000
<i>Expenditures Other than Wages and Salaries</i>		
From State and Local Government Sources	\$58,941,000	\$115,731,000
From Federal Government Sources	\$24,350,000	\$47,811,000
From Tuition, Endowment and Similar Funds, Private Gifts, Sales of Educational Activities/Medical Center, Other	\$123,118,000	\$241,742,000

### ***Regional Impacts***

As indicated in the following tables, two scenarios have been run—upper and lower limit simulations—to provide a range of likely outcomes. The lower limit is based on the assumption that 25% of UC expenditures are spent in California; the higher limit assumes that 50% of the expenditures are in California.<sup>5</sup>

The following tables show the direct and indirect impact of UC expenditures for 2002 in each of the campuses' respective regions. In 2002, the total combined impact of the UC campuses on their Gross Regional Product was estimated to be between \$11.61 billion and 13.63 billion. Statewide, the UC system generated between \$4.2 and \$4.9 billion in state and local government tax revenues in 2002.

These UC benefits are reflected in job growth for California. Beyond the employees working at each campus, in 2002 the indirect employment impact of UC expenditures created between 206,010 and 266,998 additional jobs in the Bay Area, Greater LA, San Diego and Central Valley regional economies. Across the entire state, UC expenditures resulted in a total of at least 255,509 new jobs.

Combining these indirectly generated jobs with university employees (114,000), nearly 370,000 California jobs in 2002 were directly and indirectly dependent on UC expenditures. This figure represents more than 2% of all employment in California, and is larger than the *total* non-farm employment of four U.S. states—Alaska (293,600), North Dakota (331,000), Vermont (296,100) and Wyoming (248,700).

<sup>5</sup> The REMI model generates estimates for what percentage of a dollar of expenditure in California is spent locally based on the composition of the industry base and other factors. This, though, does not help in addressing the problem of estimating what percentage of UC expenditures is spent in California.

**Figure 2-11.**  
**Regional Economic and Fiscal Impacts in 2002 (Upper Limit)**  
*(Assumption: 50% of Non-Wage Expenditures Spent in Region)*

UC Campus	Expenditure in Region	Real Gross Regional Product (GRP) Impact	Real Disposable Personal Income Impact	UC Impacts on Total State & Local Tax Revenue	Jobs Supported in Region
Berkeley	\$1.18 B	\$1.54 B	\$1.23 B	\$595 M	26,472
Davis	\$1.54 B	\$1.59 B	\$1.43 B	\$528 M	34,475
Irvine	\$940 M	\$1.44 B	\$1.12 B	\$418 M	27,210
Los Angeles	\$2.57 B	\$3.76 B	\$2.90 B	\$1.06 B	73,991
Riverside	\$329 M	\$539 M	\$390 M	\$168 M	9,548
San Diego	\$1.39 B	\$1.78 B	\$1.44 B	\$515 M	40,853
San Francisco	\$1.55 B	\$1.84 B	\$1.51 B	\$684 M	33,937
Santa Barbara	\$437 M	\$716 M	\$537 M	\$214 M	12,947
Santa Cruz	\$315 M	\$427 M	\$346 M	\$157 M	7,565
<b>Total</b>	<b>\$10.25 B</b>	<b>\$13.63 B</b>	<b>\$10.90 B</b>	<b>\$4.34 B</b>	<b>266,998</b>

**Figure 2-12.**  
**Regional Economic and Fiscal Impacts in 2002 (Lower Limit)**  
*(Assumption: 25% of Non-Wage Expenditures Spent in Region)*

UC Campus	Expenditure in Region	Real Gross Regional Product (GRP) Impact	Real Disposable Personal Income Impact	UC Impacts on Total State & Local Tax Revenue	Jobs Supported in Region
Berkeley	\$1.10 B	\$1.36 B	\$1.12 B	\$508 M	21,482
Davis	\$1.25 B	\$1.33 B	\$1.29 B	\$450 M	25,645
Irvine	\$781 M	\$1.26 B	\$1.01 B	\$368 M	22,040
Los Angeles	\$2.07 B	\$3.20 B	\$2.58 B	\$916 M	57,811
Riverside	\$271 M	\$473 M	\$368 M	\$135 M	7,938
San Diego	\$1.10 B	\$1.39 B	\$1.21 B	\$420 M	27,774
San Francisco	\$1.26 B	\$1.59 B	\$1.35 B	\$605 M	26,627
Santa Barbara	\$359 M	\$629 M	\$489 M	\$189 M	10,607
Santa Cruz	\$257 M	\$373 M	\$313 M	\$147 M	6,086
<b>Total</b>	<b>\$8.45 B</b>	<b>\$11.61 B</b>	<b>\$9.73 B</b>	<b>\$3.74 B</b>	<b>206,010</b>

## ***A Campus' Reach Is Statewide***

The regional results are low estimates of each UC campus' total impact on the *statewide* economy because they do not take into account the effect of the economic linkages among all the regions in California. The statewide level captures the impact of each campus on its region, as well as upon all of the other regions in the state. While most of a campus' impacts are concentrated in the region, there are also interregional effects modeled by REMI, which capture each campus' broader expenditure impact on the state. The interregional effects reflect the geographical spillover effects of economic activity in the state due to factors such as interregional commerce and travel.

The calculations for each campus' statewide impact—that is, the impact of each campus' expenditures on the economic indicators of all regions in the state combined—are shown in the following tables. Adding up the numbers in each column gives the UC system's aggregate impact on the *entire* state for the various indicators, including job creation, personal disposable income, tax revenue and Gross Regional Product

In 2002, the impact of the UC campuses on Gross State Product ranged between \$14.29 billion and \$16.65 billion. State and local governments accrued between \$3.7 billion and \$4.3 billion in tax revenues from the Bay Area, Greater LA, San Diego and Central Valley regional economies as a result of UC expenditures in 2002.

**Figure 2-13.**  
**Statewide Economic and Fiscal Impacts in 2002 (Upper Limit)**  
*(Assumption: 50% of Non-Wage Expenditures Spent in Region)*

<b>UC Campus</b>	<b>Expenditure in Region</b>	<b>Real Gross Regional Product (GRP) Impact</b>	<b>Real Disposable Personal Income Impact</b>	<b>UC Impact on Total State &amp; Local Tax Revenue</b>	<b>Jobs Supported in Region</b>
Berkeley	\$1.18 B	\$1.85 B	\$1.39 B	\$655 M	32,473
Davis	\$1.54 B	\$2.21 B	\$1.74 B	\$648 M	44,995
Irvine	\$940 M	\$1.66 B	\$1.22 B	\$457 M	30,800
Los Angeles	\$2.57 B	\$4.34 B	\$3.15 B	\$1.17 B	83,391
Riverside	\$329 M	\$615 M	\$423 M	\$181 M	10,828
San Diego	\$1.39 B	\$2.4 B	\$1.73 B	\$631 M	51,354
San Francisco	\$1.55 B	\$2.23 B	\$1.71 B	\$760 M	41,477
Santa Barbara	\$437 M	\$823 M	\$584 M	\$233 M	14,707
Santa Cruz	\$315 M	\$520 M	\$395 M	\$175 M	9,375
<b>Total</b>	<b>\$10.25 B</b>	<b>\$16.65 B</b>	<b>\$12.34 B</b>	<b>\$4.86 B</b>	<b>319,400</b>

**Figure 2-14.**  
**Statewide Economic and Fiscal Impacts in 2002 (Lower Limit)**  
*(Assumption: 25% of Non-Wage Expenditures Spent in Region)*

UC Campus	Expenditure in Region	Real Gross Regional Product (GRP) Impact	Real Disposable Personal Income Impact	UC Impact on Total State & Local Tax Revenue	Jobs Supported in Region
Berkeley	\$1.10 B	\$1.79 B	\$1.42 B	\$573 M	32,212
Davis	\$1.25 B	\$1.87 B	\$1.56 B	\$553 M	34,655
Irvine	\$781 M	\$1.45 B	\$1.10 B	\$403 M	25,190
Los Angeles	\$2.07 B	\$3.69 B	\$2.80 B	\$1.00 B	65,854
Riverside	\$271 M	\$503 M	\$356 M	\$146 M	8,445
San Diego	\$1.10 B	\$1.89 B	\$1.45 B	\$513 M	36,174
San Francisco	\$1.26 B	\$1.92 B	\$1.52 B	\$670 M	33,137
Santa Barbara	\$359 M	\$722 M	\$530 M	\$205 M	12,147
Santa Cruz	\$257 M	\$455 M	\$355 M	\$152 M	7,695
<b>Total</b>	<b>\$8.45 B</b>	<b>\$14.29 B</b>	<b>\$11.09 B</b>	<b>\$4.22 B</b>	<b>255,509</b>

### ***Forecasting UC's Future Impacts***

Using the upper-limit assumption, these impacts were forecasted through 2011 to show the long-term benefits of UC-generated spending as indicated below. Long-range forecasts indicate that UC expenditures from 2002 through 2011 will result in approximately \$144 billion in Gross State Product, \$56 billion in state and local government tax revenues throughout the state, and 2,362,336 new jobs statewide during that 10-year period.

## 2. Direct and Indirect Spending Impacts

**Figure 2-15.**  
**Regional Economic and Fiscal Impacts, 2002-11**  
*(Assumption: 50% of Non-Wage Expenditures Spent in Region)*

UC Campus	Expenditure in Region	Real Gross Regional Product (GRP) Impact	Real Disposable Personal Income Impact	UC Impact on Total State & Local Tax Revenue	Jobs Supported in Region
Berkeley	\$14.1 B	\$10.7 B	\$10.7 B	\$5.28 B	157,542
Davis	\$19.3 B	\$16.1 B	\$16.4 B	\$7.07 B	279,865
Irvine	\$13.3 B	\$14.9 B	\$12.3 B	\$5.60 B	226,927
Los Angeles	\$30.8 B	\$32.5 B	\$28.3 B	\$12.4 B	525,738
Riverside	\$4.80 B	\$5.70 B	\$3.70 B	\$2.10 B	80,478
San Diego	\$19.5 B	\$18.2 B	\$16.8 B	\$6.90 B	355,989
San Francisco	\$20.7 B	\$14.0 B	\$15.4 B	\$7.00 B	236,790
Santa Barbara	\$5.27 B	\$6.20 B	\$4.30 B	\$2.44 B	86,823
Santa Cruz	\$4.27 B	\$4.00 B	\$2.80 B	\$1.70 B	51,281
<b>Total</b>	<b>\$132 B</b>	<b>\$122 B</b>	<b>\$110 B</b>	<b>\$50.5 B</b>	<b>2,001,433</b>

**Figure 2-16.**  
**Statewide Economic and Fiscal Impacts, 2002-11**  
*(Assumption: 50% of Non Wage Expenditures Spent in Region)*

UC Campus	Expenditure in Region	Real Gross Regional Product (GRP) Impact	Real Disposable Personal Income Impact	UC Impact on Total State & Local Tax Revenue	Jobs Supported in Region
Berkeley	\$14.1 B	\$12.6 B	\$12.1 B	\$5.90 B	195,142
Davis	\$19.3 B	\$20.8 B	\$19.2 B	\$8.30 B	353,075
Irvine	\$13.3 B	\$16.6 B	\$13.1 B	\$6.00 B	254,497
Los Angeles	\$30.8 B	\$36.5 B	\$30.3 B	\$13.4 B	588,818
Riverside	\$4.80 B	\$6.20 B	\$3.90 B	\$2.20 B	89,558
San Diego	\$19.5 B	\$23.2 B	\$19.6 B	\$8.10 B	432,919
San Francisco	\$20.7 B	\$16.9 B	\$17.4 B	\$7.80 B	291,500
Santa Barbara	\$5.27 B	\$6.70 B	\$4.60 B	\$2.50 B	96,793
Santa Cruz	\$4.27 B	\$4.50 B	\$3.10 B	\$1.80 B	60,034
<b>Total</b>	<b>\$132 B</b>	<b>\$144 B</b>	<b>\$123 B</b>	<b>\$56.0 B</b>	<b>2,362,336</b>

### ***UC's Impact as a Magnet for Federal Dollars***

The federal dollars that fund UC expenditures also constitute an important part of the university's economic impact on California's economy. While UC receives about one-quarter of its funding from the State, the university is also a magnet for "external" dollars, drawing in revenues from sources outside the state that eventually are reinvested and multiplied in the economy. The statewide impacts of UC expenditures funded by federal dollars from 2002 through 2011—totaling \$3.07 billion in Real Gross State Product and 60,635 jobs statewide—are detailed in the following table. This projection assumes that the proportion of funding from non-federal sources in 2002 remains the same through 2011. UC's ability to further leverage these federal dollars depends on funding from other sources.

**Figure 2-17.**  
**Statewide Economic and Fiscal Impacts of UC Expenditures**  
**Funded by Federal Dollars from 2002 through 2011**

*(Assumption: 50% of Non-wage Expenditures Spent in Region)*

<b>UC Campus</b>	<b>Expenditure in Region</b>	<b>Real Gross Regional Product (GRP) Impact</b>	<b>Real Disposable Personal Income Impact</b>	<b>UC Impact on Total State &amp; Local Tax Revenue</b>	<b>Jobs Supported in Region</b>
Berkeley	\$807 M	\$371 M	\$267 M	\$120 M	8,183
Davis	\$611 M	\$187 M	\$105 M	\$46.8 M	3,682
Irvine	\$444 M	\$266 M	\$151 M	\$65.9 M	5,047
Los Angeles	\$956 M	\$706 M	\$403 M	\$175 M	13,406
Riverside	\$200 M	\$113 M	\$64.8 M	\$28.2 M	2,154
San Diego	\$1.53 B	\$738 M	\$421 M	\$181 M	14,110
San Francisco	\$869 M	\$402 M	\$288 M	\$130 M	8,829
Santa Barbara	\$286 M	\$211 M	\$120 M	\$52.4 M	4,008
Santa Cruz	\$184 M	\$71.8 M	\$51.3 M	\$23.3 M	1,576
<b>Total</b>	<b>\$5.89 B</b>	<b>\$3.07 B</b>	<b>\$1.87 B</b>	<b>\$823 M</b>	<b>60,635</b>

### ***Alternative Scenarios***

Two "worst-case" scenarios were also run: one to determine UC's effect on California's economy looking at if its expenditures, employment and student enrollment would remain flat through 2011; and another view to see what would be the effect if the UC campuses ceased to exist—an "It's A Wonderful Life" scenario. The following table summarizes the regional economic losses from 2002 through 2011 if the UC campuses did not exist.



**Figure 2-18.**  
**Regional Economic Losses if UC Campuses Ceased to Exist**  
*(Assumption: 50% of Non-wage Expenditures Spent in Region)*

UC Campuses	Total Real GRP Loss (2002-11)	Real Disposable Personal Income Loss (2002-11)	Employment Level vs. Baseline in 2011
Berkeley	-\$10.6 billion	-\$10.7 billion	-29,200
San Francisco	-\$14.0 billion	-\$15.0 billion	-45,550
Santa Cruz	-\$4.0 billion	-\$2.8 billion	-11,470
Davis	-\$16.1 billion	-\$16.4 billion	-50,650
Irvine	-\$14.9 billion	-\$12.2 billion	-40,700
Los Angeles	-\$32.5 billion	-\$28.3 billion	-75,960
Riverside	-\$5.7 billion	-\$3.7 billion	-15,660
Santa Barbara	-\$6.2 billion	-\$4.3 billion	-14,210
San Diego	-\$18.2 billion	-\$16.8 billion	-62,040
<b>Total losses in the four regions</b>	<b>-\$122.2 billion</b>	<b>-\$110.2 billion</b>	<b>-345,440</b>

*Note: Regional employment levels are permanently depressed because projected campus expenditures and employees are consistently subtracted from the regional economy over the 10-year period.*

**California would lose more than \$120 billion if the UC campuses ceased to exist.** That's an impressive number, but the much more plausible worst-case scenario is that UC expenditures would be frozen at current levels due to budget constraints. In the original simulation, growth was set at 3% annually. Taking the difference between the original growth simulation and flat growth simulation shows that flat growth for the UC system would translate into significant economic costs, as indicated in the following table. If UC expenditures, employment and student enrollment levels remained flat, job losses in the Bay Area, Greater LA, San Diego and Central Valley regions would total 110,880 from 2002 through 2011, and more than \$22 billion in combined Gross Regional Product would be lost.

**Figure 2-19.**  
**Regional Economic Losses if Campus Spending Were Flat, 2002-11**  
*(Assumption: 50% of Non-wage Expenditures Spent in Region)*

UC Campuses	Total Real Gross Regional Product (GRP) Gap (2002-11)	Real Disposable Personal Income Gap (2002-11)	Employment Difference in 2011
Berkeley	-\$1.11 billion	-\$1.24 billion	-4,734
San Francisco	-\$3.02 billion	-\$3.84 billion	-16,920
Santa Cruz	-\$740 million	-\$820 million	-4,076
Davis	-\$2.39 billion	-\$2.67 billion	-13,290
Irvine	-\$3.93 billion	-\$3.47 billion	-18,120
Los Angeles	-\$4.04 billion	-\$3.80 billion	-16,830
Riverside	-\$1.64 billion	-\$1.33 billion	-7,580
Santa Barbara	-\$790 million	-\$720 million	-3,246
San Diego	-\$3.02 billion	-\$3.84 billion	-16,920
<b>Total losses in the four regions</b>	<b>-\$22.05 billion</b>	<b>-\$22.09 billion</b>	<b>-110,880</b>

### 3. Education and Workforce Impacts

In a knowledge-based economy where capital and jobs are mobile, the quality of its workforce is a crucial determinant of where economic activity occurs—and does not occur.

Because there is a highly skilled pool of scientists and engineers being trained by the University of California, key industry clusters in California have a competitive advantage over those in competing regions elsewhere in the country and around the world. This fundamental infrastructure support provides a valuable benefit to the state economy.

Universities like UC play a positive role in enhancing California's workforce in a number of ways. Universities train undergraduate and graduate students, many of who go on to enter the workforce. Depending on the quality and quantity of this stream of graduates, a university can make substantial contributions to the overall level of human resources in a region. These human resources can translate into very real and substantial impacts for the private sector.

Universities can also play an on-going role in improving the skills of the workforce. Universities provide extension courses and degree programs for students who work, creating avenues for life-long learning—both for enjoyment as well as skill enhancement. Universities are also the training ground for the next generation of researchers, scholars and teachers, who further bolster the quality of the state's educational infrastructure from K-12 on up.

By providing women and minorities with access to higher education, universities also play an important function in enhancing economic opportunity. Inclusive access to education and training increases the chances that wages and salaries can be improved for all segments of the population.

As a part of this report, these various types of workforce impacts have been analyzed.

#### Generating a Skilled Workforce

The University of California helps educate and train students in many of the knowledge-intensive industries most critical to California's economy. While this study focuses on seven distinct clusters—aerospace, agriculture, biosciences, computers and semiconductors, information technology, telecommunications and media/entertainment—there is considerable overlap among them in terms of the skills that are required of their workforces. Given that science and engineering skills are generally the basis for the core technologies behind the goods and services produced by these clusters, these disciplines are broadly termed "cluster-related" for the purposes of this analysis.

Engineers, for instance, may work in the telecommunications, computers and semiconductors, or media/entertainment industries. For this reason, UC's total student enrollments in computer science and engineering disciplines were combined to account for analysis related to the aerospace, computers and semiconductors,

information technology, telecommunications and media/entertainment clusters. Similarly, UC health sciences and biological sciences enrollments were aggregated to estimate enrollments for assessing impacts on the bioscience industries. Agriculture enrollments include only those students who are enrolled specifically in agriculture and natural resources programs, not in the biosciences.

This section of the report provides descriptive statistics on the extent of UC enrollment and graduation in these science and engineering fields, followed by an estimate of their economic impacts on California's economy.

## ***IT and Engineering***

Over the past five years, UC student enrollment in computer science and engineering has grown at an incredible pace. The number of undergraduates studying computer science and engineering at all UC campuses increased by 60%, from 12,547 in 1996 to 20,072 in 2001. Graduate computer science and engineering enrollments likewise saw healthy gains at all campuses during this period. The graduate computer science and engineering population has increased by 44%, from 4,071 to 5,865.

**Figure 3-1.**  
**IT and Engineering Enrollments by Campus, 1996-2001**

UC Campus	Undergraduate			Graduate		
	1996	2001	Growth	1996	2001	Growth
Berkeley	2,861	3,154	10.2%	1,458	1,563	7.2%
Davis	2,540	3,237	27.4%	90	674	648.9%
Irvine	1,869	3,564	90.7%	454	634	39.7%
Los Angeles	2,067	2,682	29.8%	965	1,166	20.8%
Riverside	485	1,595	228.9%	37	180	386.5%
San Diego	1,780	3,757	111.1%	457	835	82.7%
Santa Barbara	814	1,651	102.8%	479	607	26.7%
Santa Cruz	131	432	229.8%	131	206	57.3%
<b>Systemwide</b>	<b>12,547</b>	<b>20,072</b>	<b>60.0%</b>	<b>4,071</b>	<b>5,865</b>	<b>44.1%</b>

Compared to national averages, the UC system has been very productive in terms of enrollment as well as degrees awarded. As the tables below show, the number of undergraduate engineering degrees awarded by UC between 1996 and 1999 rose 2.7% annually, compared to the national drop of -1.8%. The annual percentage change of computer science undergraduate degrees awarded was nearly five times higher than the national average in a similar period.

**Figure 3-2.**  
**Trends in Engineering Degrees Awarded**

	1996	1998	Average Annualized Percent Change
U.S. Undergraduates	63,114	60,914	-1.8%
UC Undergraduates	2,092	2,393	2.7%

*Sources: National Science Foundation, University of California*

**Figure 3-3.**  
**Trends in Computer Science Degrees Awarded**

	1996	1998	Average Annualized Percent Change
U.S. Undergraduates	37,621	39,768	2.8%
UC Undergraduates	477	884	13.1%

*Note: NSF data groups mathematics and computer science together.*

*Sources: National Science Foundation, University of California*

#### **Exhibit 1.** **The University of California in Silicon Valley**

Gordon Moore, one of the founders of Intel and a UC Berkeley graduate, suggested in 1998 that there are more Berkeley graduates than Stanford alumni in Silicon Valley, especially among those working at cluster-related companies. In fact, an estimated 160,000 UC Berkeley alumni live in the Bay Area, compared with 50,000 Stanford alumni. Moreover, UC Berkeley has over 250,000 alumni living in California.

According to recent UC Berkeley estimates, approximately 29,000 Cal alumni (10% of Cal alumni) live in Silicon Valley, and they make up a large share of its workforce. More than 600 Cal alumni are employed at Hewlett-Packard, more than 300 at Sun Microsystems, more than 400 at Intel, and more than 60 at the law firm of Wilson, Sonsini, Goodrich & Rosati, according to UC Berkeley electrical engineering and computer science department estimates. Not coincidentally, each of these companies has a Cal graduate as a founder or a high-level executive. Also of note is that UC Berkeley is second in the nation (behind MIT) in producing computer science Ph.D.s and in providing the greatest number of faculty in the nation's top 10 computer science departments.

Students from *all* UC campuses are contributing to the dynamism of California's key industry clusters, in a wide range of fields.

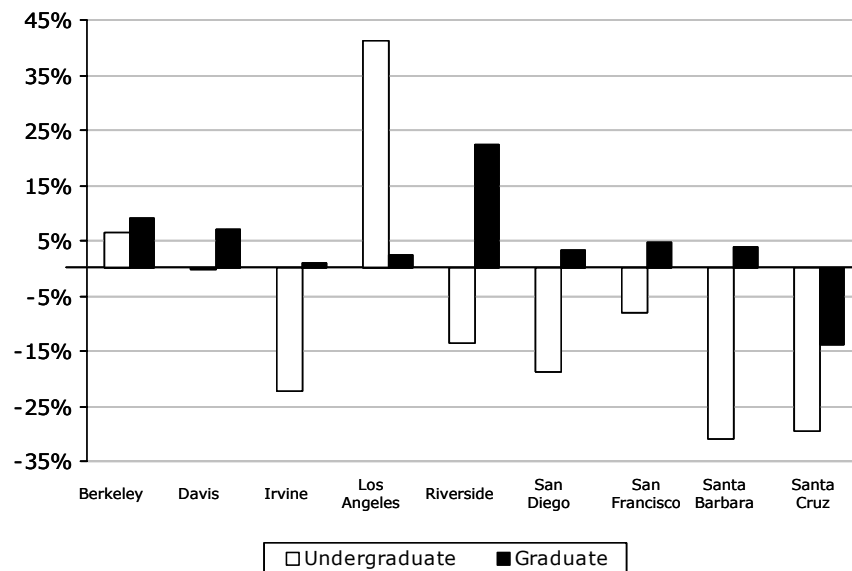
## Biosciences

Undergraduate bioscience enrollments were down systemwide over the past five years, with the exception of UCLA and UC Berkeley. Total UC enrollment in the biosciences has fallen approximately 8% (from 19,291 to 17,713). Berkeley's bioscience enrollment increased 6% (1,053 to 1,120), while UCLA saw a 41% increase (2,552 to 3,602).

**Figure 3-4.**  
**Biosciences Enrollments by Campus, 1996-2001**

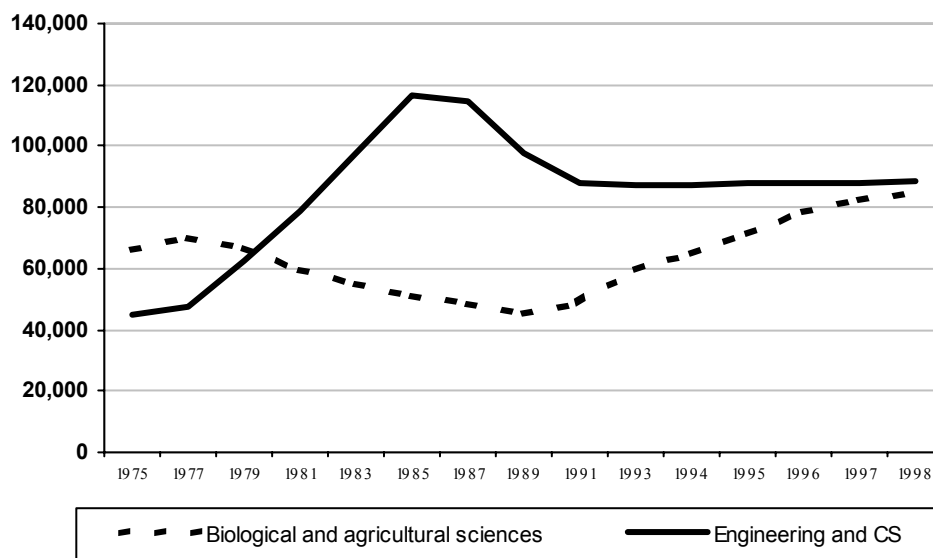
UC Campus	Undergraduate			Graduate		
	1996	2001	Growth	1996	2001	Growth
Berkeley	1,053	1,120	6.4%	989	1,080	9.2%
Davis	3,482	3,470	-0.3%	1,507	1,613	7.0%
Irvine	3,284	2,550	-22.4%	679	686	1.0%
Los Angeles	2,552	3,602	41.1%	2,551	2,611	2.4%
Riverside	2,055	1,774	-13.7%	254	311	22.4%
San Diego	3,672	2,983	-18.8%	913	942	3.2%
San Francisco	37	34	-8.1%	2,428	2,543	4.7%
Santa Barbara	2,463	1,699	-31.0%	152	158	4.0%
Santa Cruz	683	481	-29.6%	116	100	-13.8%
<b>Total</b>	<b>19,281</b>	<b>17,713</b>	<b>-8.1%</b>	<b>9,589</b>	<b>10,044</b>	<b>4.8%</b>

**Figure 3-5.**  
**Percentage Growth in Biosciences Enrollments by Campus, 1996-2001**



While UC Santa Barbara and UC Santa Cruz experienced the largest percentage decreases in bioscience enrollment, they were among the UC campuses with the largest increases in computer science and engineering enrollment. This largely inverse relationship has held historically for U.S. universities as a whole, as shown in the figure below.

**Figure 3-6.**  
**A Historical Comparison of U.S. Enrollments in the Biosciences and Engineering/Computer Science**



*Source: National Science Foundation*

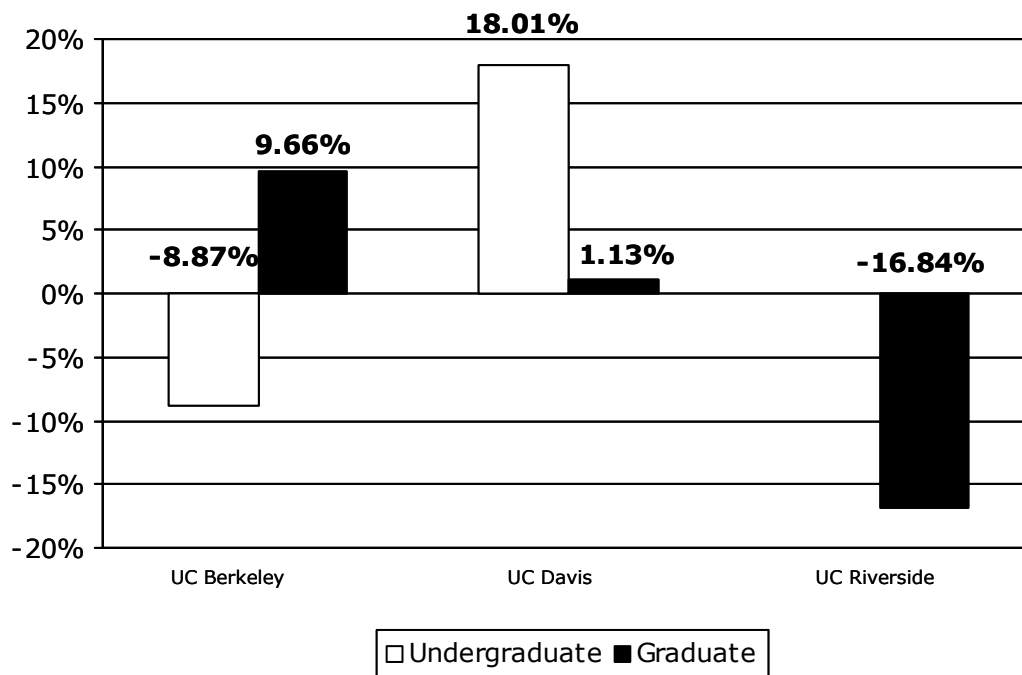
## Agriculture

Three UC campuses have degree programs specific to agriculture—Berkeley, Davis and Riverside. The largest program is at UC Davis, where undergraduate enrollment increased 18% (from 2,249 to 2,654) between 1996 and 2001. Graduate enrollments also increased at both UC Berkeley and UC Davis. Overall, graduate enrollment in agricultural sciences increased 1.5% (863 to 876) over this period. Enrollment at UC Riverside appears to have dropped in percentage terms, but the program’s small size means that its 17% decrease corresponds to only 16 fewer students. As stated earlier, this does not include enrollment changes in related bioscience or engineering sciences disciplines, which are captured in these other two categories.

**Figure 3-7.**  
**Agriculture Enrollments by Campus, 1996-2001**

UC Campus	Undergraduate		Graduate	
	1996	2001	1996	2001
Berkeley	282	257	238	261
Davis	2,249	2,654	530	536
Riverside	0	0	95	79

**Figure 3-8.**  
**Percentage Growth in Agriculture Enrollments by Campus, 1996-2001**



## Economic Impacts of UC Students

The economic impact of UC science and engineering graduates entering into industry cluster-related employment is substantial. In 2002, an estimated 3,719 UC undergraduates and graduates majoring in cluster-related disciplines will enter the workforce in related fields, generating approximately \$887 million in Gross Regional Product (GRP). Between 2002 and 2011, that GRP contribution will be about \$7.4 billion.



**Figure 3-9.**  
**Baccalaureate Degrees Awarded in Cluster-related Disciplines by Campus, 2001**

Cluster-Related Degrees Awarded	Berkeley	Davis	Irvine	Los Angeles	Riverside	San Diego	San Francisco	Santa Barbara	Santa Cruz
Biosciences	789	895	504	807	335	771	21	363	287
IT/Engineering	823	553	437	502	119	307	0	194	119
Agriculture	59	629	0	0	0	0	0	0	0

Source: UCOP

**Figure 3-10.**  
**Projected Number of Baccalaureate Degrees Awarded in Cluster-related Disciplines by Campus, 2011**

(estimates based on 2001 degree-enrollment ratio and projected enrollments, UCOP Planning Office)

Cluster-Related Degrees Awarded	Berkeley	Davis	Irvine	Los Angeles	Riverside	San Diego	San Francisco	Santa Barbara	Santa Cruz
Biosciences	910	1124	776	928	681	1078	21	441	440
IT/Engineering	949	694	673	577	242	429	0	236	182
Agriculture	68	790	0	0	0	0	0	0	0

Source: UCOP / ICF Consulting

**Figure 3-11.**  
**UC Cluster-related Undergraduates Entering California's Science/Engineering Workforce by Region**

Region	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bay Area	1,051	1,081	1,111	1,142	1,174	1,207	1,241	1,275	1,311	1,348	1,386
Greater LA	1,273	1,309	1,345	1,383	1,422	1,462	1,502	1,544	1,588	1,632	1,678
San Diego	365	375	385	396	407	419	430	442	455	467	481
Central Valley	284	292	300	308	317	326	335	344	354	364	374
<b>Total</b>	<b>2,973</b>	<b>3,056</b>	<b>3,141</b>	<b>3,229</b>	<b>3,320</b>	<b>3,413</b>	<b>3,508</b>	<b>3,606</b>	<b>3,707</b>	<b>3,811</b>	<b>3,918</b>

Source: ICF Consulting

The logic behind the REMI model is as follows: A certain percentage of UC graduates enter the workforce in fields related to their major. These workers then generate income in the state economy. This income is "multiplied" through the economy, creating additional wealth-generating effects. One key assumption of this approach to modeling these effects is that if UC did not produce these graduates, workers migrating from other regions to California would not fill these jobs. While this is not a fully accurate assumption, it is clear that many of these jobs are located in California precisely because advanced educational and research institutions do exist in the state. Conservative assumptions have been made in constructing our estimates to

avoid overstating UC's impact. For a detailed description of the methodology and assumptions of the model runs, see Appendix D.

**Figure 3-12.**  
**Estimated Regional Impact of UC Undergraduates**  
**Entering the Science/Engineering Workforce in 2002**

Region	Number of UC Graduates Entering Workforce	Estimated Real Output Per Worker (Fixed 1992 \$)	Impact on Real Gross Regional Product (includes indirect impact)
Bay Area	1,051	\$64,271	\$251 M
Central Valley	284	\$58,054	\$43.7 M
Greater LA	1,273	\$67,016	\$333 M
San Diego	365	\$64,211	\$70.5 M
<b>Total</b>	<b>2,973</b>		<b>\$698.2 million</b>

**Figure 3-13.**  
**Estimated Regional Impact of UC Undergraduates**  
**Entering the Science/Engineering Workforce, 2002–11**

Region	Number of UC Graduates Entering Workforce	Estimated Real Output Per Worker (Fixed 1992 \$)	Impact on Real Gross Regional Product (includes indirect impact)
Bay Area	12,276	\$74,448	\$1.17 B
Central Valley	3312	\$66,234	\$466 M
Greater LA	14,865	\$74,708	\$3.19 B
San Diego	4,257	\$72,644	\$734 M
<b>Total</b>	<b>34,710</b>		<b>\$5.56 billion</b>

**Figure 3-14.**  
**Estimated Regional Impact of UC Graduate Students**  
**Entering the Science/Engineering Workforce in 2002**

Region	Number of UC Graduates Entering Workforce	Estimated Real Output Per Worker (Fixed 1992 \$)	Impact on Real Gross Regional Product (includes indirect impact)
Bay Area	264	\$80,338	\$68.2 M
Central Valley	71	\$72,568	\$11.8 M
Greater LA	320	\$82,181	\$90.6 M
San Diego	92	\$78,596	\$19.2 M
<b>Total</b>	<b>746</b>		<b>\$189 million</b>

**Figure 3-15.**  
**Estimated Regional Impact of UC Graduate Students**  
**Entering the Science/Engineering Workforce, 2002-11**

Region	Number of UC Graduates Entering Workforce	Estimated Real Output Per Worker (Fixed 1992 \$)	Impact on Real Gross Regional Product (includes indirect impact)
Bay Area	3,485	\$93,060	\$400 M
Central Valley	940	\$82,792	\$149 M
Greater LA	4,220	\$93,385	\$1.09 B
San Diego	1,208	\$90,804	\$236 M
<b>Total</b>	<b>9,853</b>		<b>\$1.88 billion</b>

## The Skill and Education Continuum

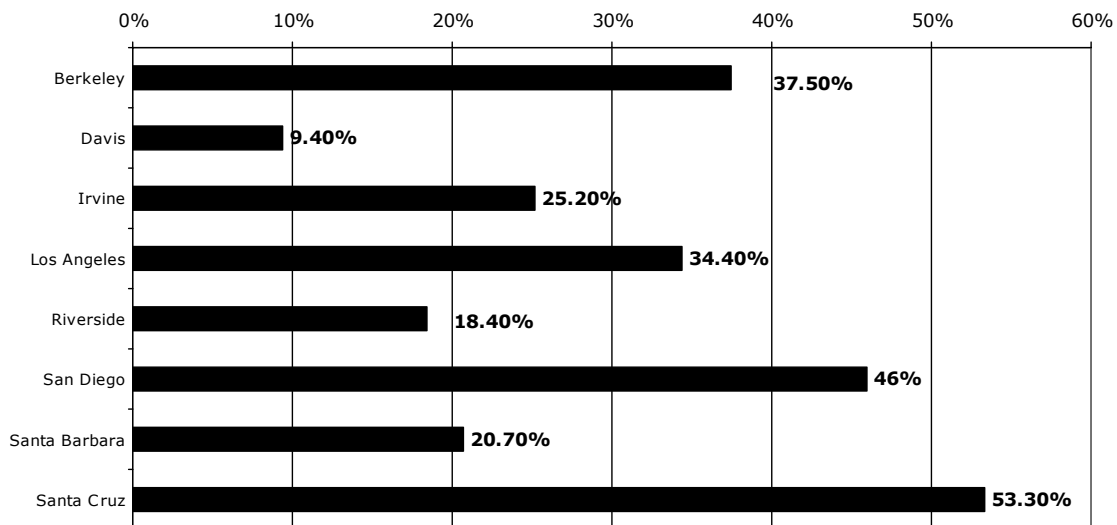
Because technology and skilled labor demands are changing rapidly, constant training, retraining, job-hopping and career movement have become more common for the workforce. Studies find that the average person changes jobs approximately 15 times and switches careers three to five times. Career planners often cite skill building as the best way to advance or enter into a new career. Continuing education programs offered through UC Extension serve the needs of a broad demographic population across California, ranging from post-graduate professionals to post-secondary individuals. They offer the opportunity to make career transitions and upgrade skills. For businesses, UC Extension provides a ready infrastructure that enables future and current employees to update their skill sets.

## **UC Extension**

Each UC campus has an extension program, which offers a wide variety of non-credit, degree credit, professional credit and certificate courses through off-campus satellite locations and in-company training programs. UC Extension offers more than 17,000 courses each year with more than 400,000 enrollments. (Note: UC's continuing education enrollment is based on the number of classes in which a student is enrolled.)

Each campus' extension program varies in course offerings and academic levels according to the needs of the surrounding community and economy. Judging by course subjects, there are sizeable enrollments in fields related to California's key industry clusters, especially in information technology and science and engineering.

**Figure 3-16.**  
**Percentage of UC Extension Enrollments in**  
**Science and Technology Subject Areas, 1999-2000**



UC campuses located in the state's most thriving technology regions have the largest percentage of students enrolled in science and technology courses. UCLA has the largest enrollment level in science and technology subjects, followed by UC Santa Cruz and UC Berkeley. These patterns reflect the positive dynamic between UC Extension and regional economies, a finding that is further substantiated by a case study of UC Berkeley's role in industry clusters (see Exhibit 2).

#### Exhibit 2.

#### UC Berkeley Extension and Industry Clusters: Enhancing the Workforce

UC Berkeley Extension helps Bay Area residents to explore subjects and obtain credentials needed to transition into traditional higher education programs, upgrade skill sets, advance their current careers or develop a new career path entirely. UC Berkeley Extension further extends UC's resources to professionals and adult students throughout the Bay Area as part of a transition, renewal and upgrading process, especially in science and technology-related subject areas.

UC Berkeley offers a wide range of high-quality and approved certificate programs and professional sequences, including ones related to information technology, computers and semiconductors. The highest number of certificate offerings systemwide are in IT and business management, followed by education and engineering. More than 30% of the courses offered in 2000-01 were in IT and engineering-related areas. Enrollments in these subjects constitute nearly 31% of UC Berkeley's continuing education students.

Related Cluster	Certificate Programs	Professional Sequences
Information Technology	<ul style="list-style-type: none"> <li>Business Intelligence and Data Warehousing</li> <li>Computer Information Systems</li> <li>E-Commerce Business and Technology</li> <li>Graphic Design</li> <li>System and Network Administration</li> <li>Technical Communication</li> <li>Telecommunications and Network Engineering</li> <li>UNIX System Administration</li> </ul>	<ul style="list-style-type: none"> <li>Computer-Aided Design</li> <li>Computer Programming</li> <li>Database Management Systems</li> <li>Integrated Marketing Communications</li> <li>Java Programming</li> <li>Linux System Administration</li> <li>Managing Technology Decisions</li> <li>Net Web Development</li> <li>Technical Communication</li> <li>Telecommunications Fundamentals</li> <li>UNIX System Administration</li> <li>VB.Net Development</li> <li>Web Design</li> <li>Wireless Communications</li> </ul>
Computers and Semiconductors		<ul style="list-style-type: none"> <li>Semiconductor Technology</li> </ul>

### Teaching the Teachers

The University of California is responsible for educating a substantial proportion of professors that go on to work not only within the UC system, but also at the California State University campuses. Based on UC figures:

- UC has provided 22% of CSU tenure-track faculty, accounting for nearly 2,500 professors.
- 22% of UC faculty have Ph.D.s from a UC campus. This is a significant number for UC, given that it recruits nationally and internationally.

## Expanding Educational Access for Economic Opportunity

The extent to which a broad segment of society has access to the resources of UC's world-class education and training opportunities serves important social as well as economic goals. Socio-economic mobility and income are highly correlated with a person's educational level.

Overall, UC has played an important role in expanding opportunities for women and minorities. Women accounted for 46% of UC undergraduates in 2002. However, many minorities tend to be underrepresented in disciplines related to key industry clusters—particularly science and engineering. At the graduate school level, women make up 47% of the graduate student body (Student Ethnicity Report, CSS330). But UC has opened many important avenues to improve educational access.

UC Berkeley, for example, has put several programs in place to encourage female students to continue their education in the sciences. Female graduates serve as mentors to current students, and the Center for Undergraduate Matters in Berkeley's electrical engineering and computer science department offers academic support programs such as the Big/Little Sister Mentoring Program. The Julia Morgan Engineering Program encourages female students to pursue engineering careers and provides educational materials about women's contributions in various engineering fields. The Society of Women Engineers is one of the largest student groups on campus.

Other campuses have also established outreach programs. For example, UC Davis has several Women in Engineering programs housed within the Center for Engineering Professionalism, including undergraduate and graduate-to-undergraduate peer-mentoring, a first-year student retreat and career field trips to local businesses. UC Santa Cruz has a women's center that offers conferences, workshops, recreation and support groups.

### Community College Transfers

One important avenue for improving minority access to a UC education is the community college system. In Fall 2002, UC campuses accepted 80% of the transfer applicants from California Community Colleges, totaling 13,627 students. California resident community college transfers have increased significantly in the five-year period between 1997 and 2002. As stated in UC's Partnership Agreement with the Governor, transfer enrollments are expected to increase to 15,300 students by 2005-06, which will likely have a positive impact on minority enrollment at UC.

**Figure 3-17.**  
**California Resident Community College Transfer Admissions, 1997–2002**

<b>UC Campus</b>	<b>Fall 1997 Admits</b>	<b>Fall 2002 Admits</b>	<b>Growth (%)</b>
Berkeley	1,983	2,147	8.27%
Davis	2,719	3,524	29.61%
Irvine	1,925	3,208	66.65%
Los Angeles	2,634	3,032	15.11%
Riverside	1,850	2,587	39.84%
San Diego	2,286	3,930	71.92%
Santa Barbara	2,725	3,670	34.68%
Santa Cruz	2,100	2,378	13.24%
<b>Unduplicated Systemwide</b>	<b>10,624</b>	<b>12,516</b>	<b>17.8%</b>

*Source: UCOP*

Many of the community college students who transfer to a UC campus are minorities. Moreover, admission from community colleges has also increased for many minority groups across the UC system. As the following table shows, American Indian, Black/African American and Chicano/Latino student admissions are up for nearly all the campuses.

**Figure 3-18.**  
**Admitted Underrepresented Community College Transfers**

UC Campus	Statistics	American Indian	Black/African American	Chicano/Latino
Berkeley	1997 Level	30	104	275
	2002 Level	16	71	294
	Growth (%)	-46.7%	-31.7%	6.9%
Davis	1997 Level	27	60	237
	2002 Level	29	92	394
	Growth (%)	7.4%	53.3%	66.2%
Irvine	1997 Level	6	31	194
	2002 Level	15	69	495
	Growth (%)	150.0%	122.6%	155.2%
Los Angeles	1997 Level	19	91	474
	2002 Level	22	99	571
	Growth (%)	15.8%	8.8%	20.5%
Riverside	1997 Level	12	69	296
	2002 Level	22	114	538
	Growth (%)	83.3%	65.2%	81.8%
San Diego	1997 Level	21	40	269
	2002 Level	26	81	547
	Growth (%)	23.8%	102.5%	103.4%
Santa Barbara	1997 Level	26	48	377
	2002 Level	34	70	645
	Growth (%)	30.8%	45.8%	71.1%
Santa Cruz	1997 Level	30	41	278
	2002 Level	22	54	266
	Growth (%)	-26.7%	31.7%	31.7%

*Note: Aggregate is total of all campuses and reflects unduplicated counts. Above statistics for California resident transfers only.*

*Source: UCOP, Student Academic Services*

In addition to the community college path, UC also has many other programs to increase the presence of minorities in science and engineering-related fields (see Exhibit 3 for some examples).



#### Exhibit 3. Expanding Access

##### UC Berkeley

**The Berkeley Edge Program** is jointly funded by the National Science Foundation and UC Berkeley (College of Chemistry, Division of Biological Sciences, Division of Physical Sciences, College of Engineering, College of Natural Resources and Graduate Division). It recruits, retains and advances the participation of underrepresented minorities in science, mathematics and engineering at all levels. The program presents the annual Berkeley Edge Conference, which brings underrepresented minority students who are competitively eligible for the Ph.D. programs to the Berkeley campus. Current students are eligible for the Berkeley Edge Fellowship and the Berkeley Edge Professional Development Award.

Berkeley Edge also provides funding for Berkeley minority student organizations such as Black Engineering and Science Student Association, Hispanic Engineers and Scientists, and American Indian Graduate Student Association. The program also supports student travel to national science organization meetings such as National Society of Black Engineers, Society of Hispanic Professional Engineers, American Indian Science and Engineering Society, and Minority Biomedical Research Program. The program sends Berkeley students and faculty on networking and recruitment exchanges to historically black colleges and universities. It also offers professional development services, which include career management lecture courses.

##### UC Davis

**Special Programs in Engineering**, administered by the College of Engineering, offers the Minority Engineering Program. This academic support unit for underrepresented minorities in all engineering majors, offers academic advising, group tutoring, summer/fall orientations, scholarships, funds for minority organizations, recruitment efforts, career development and summer internships. The program targets Black/African-American, American Indian, Mexican American and Puerto Rican students. Special Programs in Engineering also offers the Minority Opportunities for Research in Engineering and other programs geared to increase minority representation in engineering fields and research areas.

##### UC Irvine

**SAGE Scholars Program:** Through SAGE, companies offer paid multi-year internships to talented and highly motivated UCI students related to their field of study. Through these internships, business sponsors provide invaluable real-world business experience and training to students, as well as strong mentoring. In addition, SAGE Scholars participate in coursework at UCI specially designed to enhance their business and leadership skills. Participating companies contribute to a designated fund that covers educational expenses for all SAGE Scholars. The program targets students from economically-disadvantaged backgrounds with demonstrated financial need who can greatly benefit from the program's unique combination of financial support, community service, work experience and mentoring.

#### UCLA

**RAP program:** This program helps students from educationally or economically disadvantaged backgrounds who were not admitted the first time they applied to medical school. This 11-month postbaccalaureate reapplicant program offers an opportunity to take additional courses, participate in academic skills-building seminars and workshops on preparing for the MCAT exam and to gain a better understanding of the medical school application and interview process. The program also serves students who plan to work in areas of California that are medically underserved.

#### UC San Diego

**McNair Program:** The McNair Program provides low-income, first-generation college students, and students from groups underrepresented in graduate education with effective preparation for doctoral study. The McNair program is funded through grants from the U.S. Department of Education and administered at UC San Diego by Academic Enrichment Programs. It is a one-year rigorous program that includes research placement during the school year, summer internship as a research assistant on a faculty's project, technical writing development, tutoring, faculty mentoring, guidance in applying to graduate schools and fellowships, preparation for the GRE and graduate school visits.

#### UC Santa Cruz

**Minority Access to Research Centers (MARC) Program:** Funded through the National Institutes of Medical Sciences, MARC promotes the advancement of minority students in the biosciences through research training and graduate school preparation. The program helps participants enter Ph.D. programs in biological sciences and combined M.D./Ph.D. programs. MARC offers summer laboratory training, faculty mentoring, and research positions. Students in the program also receive financial support.

#### Systemwide

##### **Mathematics, Engineering, Science Achievement (MESA)**

**Engineering Program:** Part of a statewide network of engineering support programs and communities, MESA seeks to increase the engineering undergraduate enrollment and graduation rates of underrepresented minority students. The program has a strong academic focus and attention on leadership in engineering fields. Students who participate in MESA are able to travel to national conferences and network with faculty and professionals. The program also provides peer mentors, tutors, alumni mentors and career workshops. MESA supports the Society of Women Engineers, the Society of Hispanic Professional Engineers and the National Society of Black Engineers.

## 4. Technology Impacts

The University of California contributes to the state's level of technological development by playing a substantial role in innovation. This innovation is generated through two primary means. First, research and development activities enhance the productivity of labor and capital—what we produce with our work and with our money. Second, the transfer of technology and knowledge generated at UC campuses creates a direct pipeline to California's economy by providing firms with new technologies that have commercial potential and generating spin-off and start-up companies. Both of these impacts have been extremely beneficial to California.

***An estimated 7% of all R&D activity in California takes place at UC campuses. Through UC research, the state will realize productivity gains estimated at \$5.2 billion over the next decade (2002-11). This boost in productivity will in turn support the creation of more than 104,000 jobs in California.***

Moreover, according to UC's systemwide Office of Technology Transfer, more than 160 companies have already been founded on the basis of technology licensing agreements with the University of California.

### UC Research Expenditures

UC research expenditures in California reflect the strengths of the regional economies of which they are a part, confirming the positive dynamic between UC campuses and industry clusters. UC Davis and UC Riverside expenditures are significantly concentrated in agriculture. UC San Francisco, UC San Diego and UCLA concentrate research in the biosciences. UC Santa Barbara has the highest share of research expenditures related to IT, followed by UC Berkeley.

#### UC Research: Building Blocks of Regional Prosperity

The cluster approach to economic analysis emphasizes the critical economic foundations that are the building blocks of regional prosperity. As a technological foundation, the University of California builds R&D capacity to accelerate technology transfer into the production of higher income-generating businesses and consumer goods.

We have identified the research contributions of UC departments, research centers and institutes related to California's key industry clusters. Because of the integrated and overlapping nature of its research, this list is extensive but not exhaustive.

Within academia, there is a research spectrum or value-chain: there are primary foundations, or building blocks, for other more applied research areas. Basic sciences such as physics and biology are the building blocks for applications in energy and biotechnology; materials science and engineering are foundations for electrical and computer engineering research.

Appendix I contains a list of UC campus units most directly associated with the clusters, and also notes contributions to the clusters' technology foundations in the general research areas of engineering and the natural/physical sciences.

The following tables provide details about the characteristics of these campus expenditures and their roles as “building blocks” for California’s key industry clusters.<sup>6</sup>

**Figure 4-1.**  
**Research Expenditure in IT and Related Engineering by Campus, 2000-01**

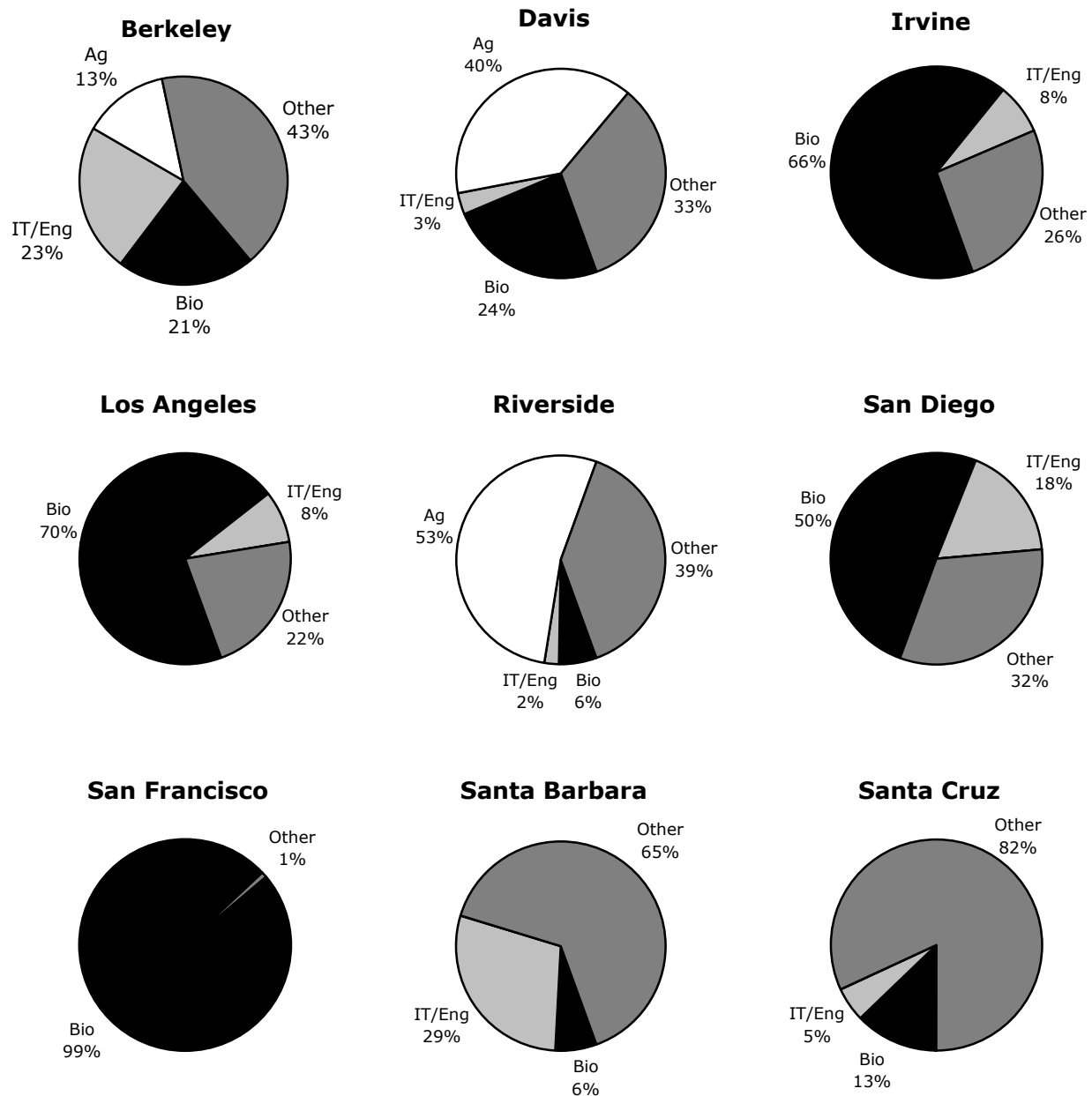
<b>UC Campus</b>	<b>Direct Research Expenditure</b>	<b>Share of Total Research</b>
Berkeley	\$77,358,000	23.1%
San Diego	\$72,586,000	17.6%
Los Angeles	\$36,138,000	8.0%
Santa Barbara	\$27,036,000	29.1%
Irvine	\$10,481,000	7.8%
Davis	\$9,502,000	3.1%
Santa Cruz	\$2,572,000	5.2%
Riverside	\$1,573,000	2.2%
San Francisco	\$0	0.0%

**Figure 4-2.**  
**Research Expenditure in the Biosciences by Campus, 2000-01**

<b>Campus</b>	<b>Direct Research Expenditure</b>	<b>Share of Total Research (%)</b>
San Francisco	\$387,250,000	99.3%
Los Angeles	\$318,351,000	70.1%
San Diego	\$208,473,000	50.5%
Irvine	\$88,861,000	66.4%
Davis	\$74,525,000	24.3%
Berkeley	\$71,625,000	21.3%
Santa Cruz	\$6,357,000	12.8%
Santa Barbara	\$5,831,000	6.3%
Riverside	\$4,115,000	5.8%

6 UC campus financial schedules classify only direct research expenditures in these research categories. Indirect expenditures (lab rental, electricity, etc.), which typically account for approximately one-quarter to one-third of total research expenditures, are not included in these numbers.

**Figure 4-3.**  
**Campus Research Expenditures by Cluster-Related Fields**



**Figure 4-4.**  
**UC Berkeley Top 10 Research Centers by Expenditure**

<b>Rank</b>	<b>Research Center</b>
1	Electronics Research Laboratory
2	Agricultural Experiment Station
3	Space Sciences Laboratory
4	Institute of Transportation Studies
5	Engineering Systems Research Center
6	Earthquake Engineering Research
7	Survey Research Center
8	Plant Gene Experiment Center
9	Institute for Business and Economic Research
10	Radio Astronomy Lab

**Figure 4-5.**  
**UC Davis Top 10 Research Centers by Expenditure**

<b>Rank</b>	<b>Research Center</b>
1	Agricultural Experiment Station
2	Primate Center
3	National Institute for Global Environmental Change
4	Institute of Toxicology and Environmental Health
5	Crocker Nuclear Laboratory
6	Center for Neuroscience
7	Bodega Marine Laboratory
8	John Muir Institute for the Environment
9	Center for Comparative Medicine
10	McClellan Nuclear Radiation Center

**Figure 4-6.**  
**UC Irvine Top 10 Research Centers by Expenditure**

Rank	Research Center
1	Brain Aging Institute
2	Health Policy Research Unit
3	Developmental Biology Center
4	Institute for Transportation Studies
5	Center for Research on Information Technology and Organizations
6	Institute for Software Research
7	Interdisciplinary Research Unit
8	Cancer Research Institute
9	Institute for Surface and Interface Science
10	Center for Neurobiology of Learning and Memory

**Figure 4-7.**  
**UCLA Top 10 Research Centers by Expenditure**

Rank	Research Center
1	Neuropsychiatric Institute
2	Jules Stein Eye Institute
3	Institute of Geophysics and Planetary Physics
4	Molecular Biology Institute
5	Jonsson Comprehensive Cancer Center
6	Institute of the Environment
7	Brain Research Institute
8	Dental Research Institute
9	Crump Institute
10	Asian American Studies Center

**Figure 4-8.**  
**UC Riverside Top 10 Research Centers by Expenditure**

<b>Rank</b>	<b>Research Center</b>
1	Agricultural Experiment Station
2	Center for Environmental Research and Technology
3	Center for Bibliographical Studies
4	Air Pollution Research Center
5	Institute of Geophysics and Planetary Physics
6	Robert Presley Center for Crime and Justice
7	Center for Ideas and Society
8	Center for Social and Behavioral Sciences
9	Center for Research in Intelligent Systems
10	Center for Nanoscience and Engineering

**Figure 4-9.**  
**UC San Diego Top 10 Research Centers by Expenditure**

<b>Rank</b>	<b>Research Center</b>
1	Scripps Institution of Oceanography
2	Cancer Center
3	Fusion Energy Research Center
4	Astrophysics and Space Science Center
5	Research in Biological Structures
6	Whitaker Biomedical Engineering Center
7	Center for Research in Language
8	Magnetic Recording Research Center
9	Pure and Applied Physical Sciences Institutes
10	Biological Structures Center



**Figure 4-10.**  
**UC San Francisco Top 10 Research Centers by Expenditure**

Rank	Research Center
1	Neurology
2	Cancer Institute
3	Cardiovascular Institute
4	Pediatrics
5	Obstetrics and Gynecology
6	Epidemiology and International Health
7	Biochemistry and Biophysics
8	Surgery
9	Radiology
10	Institute for Health Policy Studies

**Figure 4-11.**  
**UC Santa Barbara Top 10 Research Centers by Expenditure**

Rank	Research Center
1	Marine Science Institute
2	Quantum Institute
3	Institute for Computational Earth Systems Science
4	Institute for Theoretical Physics
5	Institute for Social Behavioral Economic Research
6	Neuroscience Research Institute
7	Institute for Crustal Studies
8	Institute for Polymers and Organic Solids
9	Quest Science and Technical Research Center
10	Center for Chicano Studies

**Figure 4-12.**  
**UC Santa Cruz Top 10 Research Centers by Expenditure**

<b>Rank</b>	<b>Research Center</b>
1	Institute of Marine Sciences
2	Institute for Particle Physics
3	Lick Observatory
4	Institute of Tectonics
5	Center for Agroecology
6	Institute for Geophysics and Planetary Physics
7	Bilingual Research Center
8	Dickens Project
9	Humanities Research Institute
10	Center for Justice Tolerance

## Productivity Gains

Research expenditures, like any other expenditure, can have a direct impact on employment and production. These direct effects of UC research expenditures have been already estimated in the spending impacts chapter. But the interaction between research and industry clusters suggested by the data above indicates another important impact of research expenditures—their role in improving productivity through innovation. Innovation can enhance the efficiency of labor and capital, or what is known as Total Factor Productivity. Indeed, these gains may be even more significant than the direct impacts discussed earlier.

Total Factor Productivity (TFP) is a measure that captures how labor efficiency and productivity translate into economic growth. The following illustrative equations capture the essence of the concept (for a more detailed account, see Appendix E).

**Labor Productivity Growth = Total Factor Productivity Growth + Growth in Capital Stock**

**Total Factor Productivity = Improvements in Capital Quality + Improvements in Society's Stock of Knowledge and Skills**

As a major conduit of technology transfer and knowledge-building in California, UC contributes to the capital and skills components of TFP. Using the REMI model, an estimate of the economic value of UC's campus-by-campus contribution to TFP has been generated by campus (see Appendix E for methodology).

***Approximately 1.3% of the growth in California's Gross State Product over the next decade can be attributed to productivity gains resulting from UC research activities. Productivity gains derived through UC research will contribute an estimated \$5.2 billion to the growth in Gross State Product and create more than 104,000 new jobs between 2002 and 2011.***

The following table summarizes the individual campuses' impacts.

**Figure 4-13.**  
**Dynamic Impact of UC Research on Gross State Product Growth, 2002-11**

<b>UC Campus</b>	<b>Estimated Impact on Real Gross State Product Growth Due to Productivity Gains</b>	<b>Estimated Job Creation (assumes 20 jobs per \$1 million in expenditures)</b>
Berkeley	\$823 M	16,460
Davis	\$684 M	13,680
Irvine	\$301 M	6,020
Los Angeles	\$996 M	19,920
Riverside	\$157 M	3,140
San Diego	\$991 M	19,820
San Francisco	\$953 M	19,060
Santa Barbara	\$207 M	4,140
Santa Cruz	\$122 M	2,440
<b>Total</b>	<b>\$5.2 billion</b>	<b>104,680</b>

## **Innovation and Commercialization: Research Funding, Inventions and Start-ups**

Universities have long been centers of basic research and development, but they have increasingly also served as important conduits for applied research with valuable commercial applications that benefit both the economy and our quality of life. As one of the premier research and educational institutions in the country, the knowledge and resources in the University of California system are of immense social and economic value. This value is reflected by the extent to which private firms seek out UC's world-class research expertise and by other indicators which show that UC produces knowledge that readily makes it way into the marketplace and into our homes.

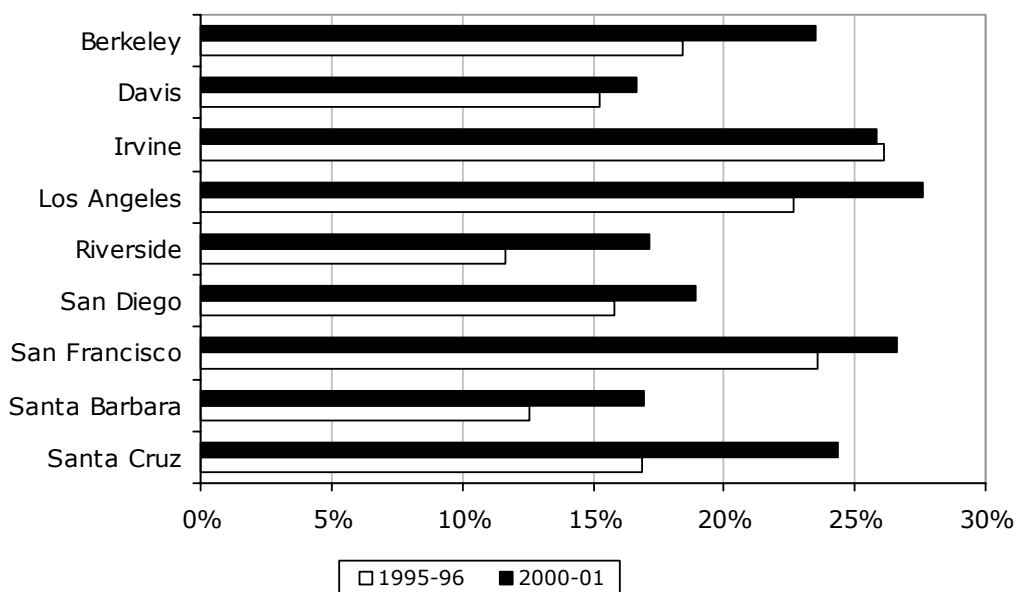
More and more private firms recognize the value of the UC system by contributing financial resources for research. For 2000-01, UC entered into more than 2,600 agreements with industry valued at more than \$216 million. In terms of research

expenditures, private-sector sources have increased faster than all other sources of UC funding. Since 1995-96, private-sector research expenditures for the UC system have increased 80%, while UC's total research expenditures grew by only 53% over the same period. Private-sector funds have increased as a share of total research expenditures across nearly all UC campuses.

**Figure 4-14.**  
**Growth of Expenditures by Funding Source, 1995-96 to 2001-02**

Private Sector	General and State Funds	Federal Funds	Other
80%	77%	38%	43%

**Figure 4-15.**  
**Share of Campus Research Expenditures from Private-Sector Sources**



## ***University-Industry Partnerships***

In some cases, the research collaborations between UC campuses and industries have been deliberately cultivated through public-private partnerships, including the four landmark California Institutes of Science and Innovation, which were launched with state matching funds to foster future economic growth through UC-industry research in biomedicine, nanotechnology, telecommunications, information technology and other technologies to solve social problems (see Exhibits 4 and 5 below). Many cutting-edge technological developments and research projects are often in fields directly related to the knowledge industry clusters and thus amplify many of the productivity gains from research expenditures. A sample of some of

the largest UC contracts and grants from the private sector offer additional proof. For 2000-01, some of the largest contracts were in research fields directly related to industry clusters—IT, computers and semiconductors, agriculture and the biosciences (Figure 4-16).

**Figure 4-16.**  
**UC Research Contracts by Related Industry Cluster**

Related Industry Cluster	Contract	Contract Amount
Computers and Semiconductors	Microelectronics Advanced Research Corp.—Design and Test of Gigascale Integrated Systems	\$6,733,000
Computers and Semiconductors	Semiconductor Research Corporation—Lithography for Terascale Electronics	\$4,900,000
Computers and Semiconductors	Realtimehealth, Inc.—Microfabricated High Performance Immunoanalyzers	\$829,000
Computers and Semiconductors	Hewlett-Packard—Defect-Tolerant Moletronics Consortium	\$1,654,000
IT	Tata Sons Ltd.—Infrastructure Support for Network-Based Content Delivery	\$654,000
Biosciences	AstraZeneca—Study of pulmonary problems in Costa Rican farmworkers	\$799,000
Biosciences	Mars, Inc.—Cardiovascular benefits of certain cocoa polyphenols	\$654,000
Biosciences	Allergan—Glaucoma clinical trials	\$358,000
Biosciences	Pharmdel, Inc.—Diabetes Research	\$416,000
Biosciences	Eli Lilly—ADHD study	\$323,000
Biosciences	Novartis—Leukemia study	\$1,277,000
Biosciences	The Bugher Foundation—Study of Vascular Formation	\$242,000
Biosciences	Alza Corporation—Bladder Origin Pelvic Pain	\$834,000
Biosciences	Virologic, Inc.—Clinical Strategy of HIV-1 Phenotypic Resistance	\$716,000
Biosciences	Onyx Pharmaceuticals—Viral Methods for Treating Cancer	\$1,479,000
Biosciences	GlaxoSmithKline—Study of Patients Receiving Combination Therapy	\$1,055,000
Biosciences	Genentech—Study of Efficacy and Safety of anti-CD11 (cardiovascular drug)	\$993,000
Biosciences	Geltex Pharmaceuticals, Inc.—Preparation of Polyamino Acids for Pharmaceutical Application	\$331,000
Agriculture	Ceres, Inc.—Virtual Seed Institute	\$1,865,000

#### **Exhibit 4.**

### **California Institutes for Science and Innovation**

The California Institutes for Science and Innovation, launched in December 2000, have an explicit state mandate to bring UC and industry researchers together to create the "Next New Economy." The guiding idea behind the institutes is that when industry scientists and engineers participate in and support institute research programs, a streamlined commercialization pipeline will be created that transfers basic research to the private sector at an accelerated rate, enhancing California's competitiveness.

The multi-campus institutes include the California Institute for Bioengineering, Biotechnology and Quantitative Medicine (QB3) at UC Berkeley, UC San Francisco and UC Santa Cruz; the California Institute for Telecommunications and Information Technology (Cal-IT2) at UC Irvine and UC San Diego; the Center for Information Technology Research in the Interest of Society (CITRIS) at UC Berkeley, UC Davis, UC Merced and UC Santa Cruz; and the California Nanosystems Institute (CNSI) at UCLA and UC Santa Barbara.

The nanosystems institute has already developed alliances with more than 30 industry players in each of California's key industry clusters, including Affymax (biosciences), Agility Communications (telecommunications), Ceres, Inc. (agriculture), Intel (computers and semiconductors), Oracle (information technology) and Rockwell Scientific (aerospace).

CNSI-related start-up companies include Quantum Dot Corporation, Carbon Nanotechnologies, NanoSys, LA Tech Center (PetNET Pharmaceuticals, and Agensys. Agensys and Quantum Dot were formed before CNSI but have incorporated CNSI-related technologies. In addition to these industry partnerships, CNSI researchers have already procured more than \$75 million in large federal contracts for their research.

Cal(IT)2 researchers have developed partnerships with AMCC, Ericsson, Intel and IBM to develop telecommunications technologies. Many of the new technologies that Cal(IT)2 develops will be incorporated into "living laboratories" that allow policymakers, business management experts, cognitive scientists, educators and artists to study the effect of the technologies on human interaction, expression and creativity, learning and productivity. Southern Californians will thus be the first to experience these new technologies.

Governor Gray Davis signed legislation in April 2002 to provide \$308 million in lease-revenue bonds to help build the four institutes. The state eventually plans to invest \$100 million in each institute, and has challenged UC and industry to match every dollar provided by the state with at least two dollars in non-state funding. Based on the initial progress of the institutes, it seems likely that industry's contribution will exceed these expectations.

For more information about the institutes, visit UC's web site at: <http://www.ucop.edu/california-institutes/welcome.html>.

### Exhibit 5. Industry-University Cooperative Research Partnership

The Industry-University Cooperative Research Program does not involve specific researchers and facilities in the same way that the California Institutes for Science and Innovation do. Rather, it awards grants in biotechnology (BioSTAR); computers, networking and operating systems (CoRe); digital media (DiMi); life sciences information technology (LS:IT); microelectronics (MICRO); and electronics manufacturing (SMART).

UC principal researchers submit proposals for the program's California Discovery Grants. The researcher's private sponsor must contribute at least half of the dollars needed for the project (at least a 1:1 match). Private sponsors must engage in some type of economic activity within the state, to ensure that the research will benefit the California economy.

The program has grown to more than \$60 million a year, with well over half of research sponsored by private industry.

For more information about the Discovery Grants and other UC-industry partnerships, visit: <http://uc-industry.berkeley.edu>.

## UC Inventions and Patents

In addition to collaborative research, UC is also an important generator of ideas and technologies. One measure of UC's role in this capacity is *invention disclosures*. UC researchers are required to "disclose," or formally report, all of their inventions created with university resources. UC campuses have collectively generated more than 2,600 invention disclosures. The following table provides a campus-by-campus breakdown of these disclosures.

For the past nine years, UC has topped the annual list of U.S. universities receiving the most patents for inventions (i.e., utility patents). According to the preliminary list for 2002 from the U.S. Patent and Trademark Office, UC was responsible for 431 patents during the 2002 calendar year—more than the next three universities combined. In 2001, UC totaled 402 patents.

"Researchers at our academic institutions greatly advance the progress of American science and technology," said James E. Rogan, Undersecretary of commerce for intellectual property. "Their patented inventions, from simple mechanical devices to the most sophisticated biomedical breakthroughs, are transferred to industry, where job opportunities are created and the quality of our lives is enhanced significantly."<sup>7</sup>

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<sup>7</sup> U.S. Patent and Trademark Office, February 26, 2003, <http://www.uspto.gov/web/offices/com/speeches/03-09.htm>

**Figure 4-17.**  
**Invention Disclosures and Research Efficiency, 1998-99 through 2000-01**

<b>UC Campus</b>	<b>Total Research Expenditures</b>	<b>Total Invention Disclosures</b>	<b>Disclosures per \$10 M in Research Expenditure</b>
Berkeley	\$941,665,000	300	3.19
Davis	\$762,458,000	235	3.08
Irvine	\$356,063,000	203	5.70
Los Angeles	\$1,181,514,000	427	3.61
Riverside	\$190,070,000	102	5.37
San Diego	\$1,145,165,000	657	5.74
San Francisco	\$1,013,215,000	460	4.54
Santa Barbara	\$268,764,000	215	8.00
Santa Cruz	\$130,255,000	57	4.38
<b>Total</b>	<b>\$5,989,169,000</b>	<b>2,656</b>	<b>4.43</b>

### ***UC Start-ups***

Many of the technologies developed in the UC system also serve as an important engine for economic growth through another avenue: by serving as the basis for start-up firms. Indeed, more than 160 companies have been founded on the basis of technology licensing agreements with the University of California. An estimated 65% of these firms are in fields directly related to the bioscience cluster—biotechnology, genomics, pharmaceuticals and drug development.

The start-up figure does not include all of the firms that have been started by UC professors, graduates and undergraduates. No systematic data exists but anecdotal information regarding such companies suggests that their economic impact is extensive. Brief profiles of Chiron, Inktomi and Agility Communications—California-headquartered companies founded by UC graduates with combined 2001 revenues exceeding \$1.2 billion—are located in Appendix I.



**Figure 4-18.**  
**Selected List of Companies Founded on the Basis of UC Technology Licensing**

<b>Biotechnology</b>	<b>Pharmaceuticals</b>	<b>Medical Devices</b>	<b>Tests and Measurements</b>
Abaron Biosciences	Agensys	Brain Dynamics	Digital Instruments, Inc.
Androclis Therapeutics	AriZeke Pharmaceuticals	Calhoun Vision	Quadrant Imaging
Applied Phytologics	AvMax	GlySens	SpectruMedix Corporation
Aurora Biosciences Corporation	BioSante Pharmaceuticals	Intra-Medical Imaging	
Biagro Western Sales, Inc.	Collateral Therapeutics	Thuris	
Canji, Inc.	Cortex Pharmaceuticals, Inc.	Uros	
Cell Genesys	Cytokinetics Pharmaceuticals		<b>Software</b>
Celladon	Dynavax Technology Corporation		Inktomi Corporation
Chiron Corp	GeneTrol Biotherapeutics	<b>Energy</b>	Neomorphic Software, Inc.
DNA Sciences	ID Vaccine Corporation	Onsite Power Systems	Pixon
EpiGenX Pharmaceuticals	Iguazu Biosciences	RHA Technology	Praja
Exelixis Pharmaceuticals, Inc.	Inologic	Advanced Materials	Scientific Learning Corporation
Genentech, Inc.	Intrabiotics Pharmaceuticals	Composite Solutions	SignalCom
Genicon Sciences	Islet Technology, Incorporated	MMFX Steel Company of America	TruVideo, Inc.
Generic, Inc.	KBC Pharma	Nitres	Viasense, Inc.
Geron Corporation	Meyer Pharmaceuticals, LLC	Seashell Technology	
Hermes Biosciences	Myelos Neurosciences	SiGen	<b>Photonics</b>
I-MEDD	NeoGene Technologies	Surfx Technologies	Agility Communications
Immusol	Nereus Pharmaceuticals	TefLabs	Alien Technology Corporation
Iris MicroMedical	NeurogesX	Zettacore	Alvesta Corporation
PanCel Corporation	ONYX Pharmaceuticals		Bandwidth9, Inc.
Pangenix	Octamer	<b>Chemicals</b>	Genoptix
Planet Biotechnology, Inc.	Ontogen	Halosource	ModeTek
Protein Pathways	Parnassus Pharmaceuticals	<b>Computer Hardware</b>	Onix Microsystems
Protos Corporation	Penederm Incorporated	Calimetrics, Inc.	Terabit Technology
Remedyne	ProDuct Health	Ttech Systems	Uniax
Sagres Discovery	Salmedix		Yuni Networks
Sangart	Serra Pharmaceuticals		
Senomyx	Sunesis Pharmaceuticals, Inc.		
Signal Pharmaceuticals	VIRASIM, Inc.		
Tissue Technologies, Inc.			
World Blood			
Xenometrix			

*Source: UCOP Office of Technology Transfer*

## UC and California's Digital Media Economy

Digital media—the synergistic convergence of media, entertainment and technology—includes the fields of art, architecture, information technology, geographic information systems and engineering. Digital media opportunities in research partnerships, training and innovations are substantially advancing California's global digital economy. Today, more than 30% of the nation's digital technology and media companies are based in California.

Most of California's digital media firms are based in the San Francisco and Los Angeles areas. Los Angeles is the center for the nation's multimedia cluster, while Silicon Valley holds the major concentration of the nation's high tech clusters. In fact, Los Angeles County accounts for 50% of the nation's motion picture/TV production jobs. The Bay Area accounts for at least 25% of all jobs in digital media fields and related markets.

Since the onset of the information revolution of the last decade, a wide range of California industries—from information technology, telecommunications and

e-commerce to health care to manufacturing and agriculture—increasingly depend upon innovative applications of digital media technologies. Because companies rely more and more on outsourced R&D, especially to universities, UC plays a critical role in driving the state’s digital media economy.

Beyond its economic impacts, digital media is also transforming the average Californian’s quality of life. With technology that can be applied in many unique outcomes and products, such as health access via telemedicine tools, media imaging devices, children’s educational tools, movies/TV, computers and information management and consumer electronics, UC’s contributions to digital media R&D and its technology transfer to California industries enhance our quality of life in many areas of daily activity. The public also benefits from more efficient innovation processes and better technologies that give more people access to more affordable digital media products.

### ***UC’s Digital Media Innovation (DiMI) Program***

UC’s effort in digital media is an excellent example of the system’s innovation and commercialization impacts. Through education, training and R&D opportunities, UC helps to foster the growth of the state’s digital media infrastructure—and extend its national and international impacts nationally. UC is channeling much-needed knowledge and technology, and leveraging important capital, financial and workforce resources, into the digital media pipeline.

Given UC’s existing strengths in the engineering and non-engineering foundations of digital media, such as computer engineering, information technology, and media arts, UC is able to effectively capture basic and applied scientific knowledge and intellectual property, and add value by moving discoveries through the development and deployment phases of economic innovation.

By attracting R&D investments, increasing business and research support, and leveraging a skilled digital media workforce, UC is improving the concentration of this high-tech sector’s cluster components and the cross-fertilization of ideas among scientists and business managers in this field. Ultimately, this accelerates the pace of technology development and knowledge spillover to California industry, all of which benefits consumers.

The Digital Media Innovation Program (DiMI), headquartered at UC Santa Barbara, is a systemwide research and technology transfer program, providing matching grants and partnering researchers from the UC campuses and three UC-managed national laboratories with industry partners and others in the research community who are pursuing digital technology and digital media developments. DiMI is one part of UC’s Industry-University Cooperative Research Program, which fosters research collaboration in basic and applied sciences and facilitates the transfer of knowledge and technology. Ultimately, DiMI helps accelerate the process of digital media and digital technology commercialization for the public’s benefit.

DiMI’s impact is internationally recognized by industry and the research community. In addition to providing matching grants, the program brings the academic and industry communities together in a collaborative framework. DiMI is distinguished

for its identification of a heterogeneous group of researchers from around the world and creating physical and virtual portals by which they can engage in the cross-fertilization of ideas. Together with its industry partners, DiMI has effectively generated and yielded potential products, new protocols and paradigms, improvements to existing technology and a myriad of patents and licenses. While other entities conduct digital research activities (including Stanford and Caltech), *no other programs in California or elsewhere in the U.S. have either emulated DiMI's scope or paralleled its contributions to codifying digital media and digital technology collaboration and transfer.*

### Areas of Innovation

DiMI supports new, early-stage and pre-competitive research in digital media, with emphasis on multidisciplinary approaches. Researchers from a range of non-engineering disciplines are encouraged to partner with researchers from engineering disciplines. The array of non-engineering disciplines is vast: agriculture, architecture, astronomy, business management, cognitive science, dentistry, education, environmental science, film, humanities, journalism, law, library science, life science, medicine, music, pharmacology, physical sciences, psychology, public health, social science, television, theater, veterinary medicine and visual arts.

DiMI research areas involve networking including protocols, processing, routing and mobility; multimedia systems and applications; distributed and parallel computing systems including multicast tools, applications and management; user interfaces and computer vision; distributed audio and video databases and applications; real time video, audio and data processing and applications including scalable video on demand with interactivity; virtual and intelligent environments, systems and components; storage, retrieval, distribution and protection (PKI cryptography) of digital assets; wireless applications and integrated wireless multimedia environments; remote sensing and sensor systems, devices and components; and standards.

Its research fosters innovative core technology and content development in a variety of digital media areas, including detection, storage, retrieval, interface and presentation of media data, signal manipulation and transformation, hardware, operating systems and support language for media data. This research has led to the development of core digital media technologies such as computer hardware, software, data formats and representations, data mining, display and projection, imaging, intelligent systems ("smart" technology), sensing, signal processing, storage, transport and networking, and visualization.

These DiMI core technologies form the basis of many commercial application areas, such as audio, distance learning, multimedia, virtual reality and modeling, and telemedicine, among others. The scope of DiMI's research and technology development supports commercial applications in a broad array of industries, including agriculture, architecture, arts, biological imaging, communications, information technology and e-commerce, education, TV/film, music, health care,

informatics, legal services, manufacturing, medicine, telecommunications and transportation.

## **Process of Innovation**

Through the identification and centralization of a vast research community, DiMI has helped to catalyze many multi-lateral research partnerships and opportunities among UC faculty, non-UC researchers and industry. DiMI collaboration activities include "think tanks" (e.g., DiMI Tech Forums and DIGIVATIONS), the DiMI Gateway and Dissemination of scholarly works through publications and workshops. In addition to providing a portal for industry and the research community to exchange ideas and source literature, the program supports 15-20 new research partnerships a year.

To submit a proposal for matching grants, UC faculty (or non-UC faculty with "principal investigator" status) must secure a binding commitment from a private sponsor to fund research. Researchers identify companies with mutual research interests through DiMI resources and channels such as professional associations and meetings.

The UC Office of Technology Licensing and Technology Transfer can also assist in the identification of companies that sponsor or would like to sponsor UC-based research. Proposals are selected annually based on scientific and technical merit, training opportunities, relevance to DiMI and California. UC faculty and students conduct selected DiMI research projects. There are currently 39 ongoing DiMI research projects in the UC system.

## **Funding**

State resources and business partnerships support DiMI's collaborative research projects. DiMI was launched in February 1998 with \$1.5 million in annual base UC and state funds. The collaborative funding partnerships have vested UC support of digital media commercialization into important sectors in California's economy. To date, DiMI has funded more than 64 Discovery Grants with over \$9 million in UC-state funds and \$14 million from private industry contributions, according to DiMI Associate Director Steve Berman ([www.digitalcoastinsider.org](http://www.digitalcoastinsider.org), Aug. 16, 2002). Almost two-thirds of the sponsoring companies are small businesses.

For FY 2001-02, DiMI had more than \$3.5 million to invest in research projects. DiMI has also received support from more than 50 private-sector entities that provide funds for the various UC faculty-initiated projects.

The level of industry sponsorship varies with each project's authorized budget. DiMI matches dollar-for-dollar private contributions for direct costs; and private sponsors contribute indirect support only on their portion of direct matching dollars. The projects range from \$25,000 to \$1 million in annual matching funds, with project periods ranging from one to four years.

**Figure 4-19.**  
**UC DiMI Industry Sponsors**

550 Digital Media Ventures	Interactive Pictures Corporation
Agfa Division / Bayer Corporation	Interval Research Corporation
ALEKS Corporation	ISG Technologies
Alias   Wavefront	Maxim Integrated Products
Aureal Semiconductor	Nokia Corporation
CALTRANS, Testbed Center for Interoperability	Nortel Networks
Celebrity Teachers Corporation	Olicon Imaging Systems, Incorporated
Chevron Corporation	OneCosmos
Creative Advanced Technology Center	PharmQuest
DaimlerChrysler	Seagate Technology
DENSO Corporation	SETI Institute
Digital Equipment Corporation	SGI
Direct Enterprises	Sony Corporation
E-mu Systems, Incorporated	Sony Electronics Incorporated
EON Reality Incorporated	Sony Pictures Entertainment
FileNET Corporation	SPARC
FujiFilm Computer Products	ST Microelectronics
Fuji Photo Film U.S.A	Stratonics, Incorporated
General Atomics	Sun Microsystems, Incorporated
Geostat	The Planetary Society
Gibson Guitar Corporation	Tata Consultancy Services
Hewlett Packard	Trimble Navigation Limited
Honda	Trimedia Technologies, Inc.
HRL Laboratories	United Devices
I/O Software, Incorporated	Warner Bros.
	Win Research

*Source: DiMI*

### Industry Benefits

DiMI research projects have generated substantial impact for digital media and digital technology products and paradigms, resulting in millions of dollars of key industry-research collaborations and industry-industry partnerships. Many of these enterprises would not have been created without DiMI's program design. The program's results to date include:

- Creating and establishing standards for distributed computing platforms and applications through projects such as SETI@home, the experiment that developed the world's largest supercomputer.
- Defining new methods, applications, protocols and tools for storing, indexing, retrieving, managing, distributing, displaying, projecting and protecting audio, video and textual data.
- Developing methodologies and systems which enable effective and value-added data mining in areas such as drug discovery; creating applications and tools

which serve as the basis for intelligent environments and systems, including telematics.

- Creating, developing and deploying intelligent sensor and GIS systems for precision agriculture, and environmental impact studies and analysis of ecosystems through use and development of remote sensing.
- Enabling devices and systems that enhance and redefine interactive media such as immersive environments.
- Defining new user interfaces, GUIs and PUIs.
- Solving critical problems such as traffic flow and control using predicative analysis, simulation systems, virtual environments, and the remote deployment of robots to improve highway safety and decrease traffic congestion.
- Generating a substantial number of scholarly publications and patents.

Through its sponsorship of DiMI research projects, private industry receives substantial business and cost benefits, which help accelerate the commercialization process. These benefits include: leveraging of private-sector research investment with DiMI funding; significant federal and state tax credits; access to UC's research faculty and students; accelerated knowledge and technology transfer; first rights to negotiate exclusive intellectual property arrangements; participation in development of a high-tech workforce; and expansion of the private sector's R&D capacity for the testing of new materials, equipment and software.

Because these benefits are meant to improve and enhance the performance of California's digital media enterprise through commercialization and job creation, private sponsorship is targeted towards California companies and other entities (e.g., foundation, institute, individual). However, out-of-state private sponsors are also eligible if they demonstrate the ability to create a measurable digital media reinvestment or benefit to California.

In addition to enabling the interchange and convergence of ideas between researchers and industry, DiMI research and business partnerships also harness the human resources capacity for the digital media infrastructure in California. The DiMI program trains and provides the talented, highly skilled people needed to support the advancement and deployment of digital media applications and products.

Since DiMI research projects are carried out by UC faculty and students on a UC campus, one of the direct impacts is the provision of training opportunities, especially for graduate students and post-doctorates. The investment in research and resources harnesses and expands the future base of researchers and students, thereby transferring knowledge into the digital media private sector.

## **Campus Multimedia Resources**

In addition to the systemwide DiMI R&D investment program, most UC campuses have departments and centers that conduct research and provide training in digital media-related academic areas. Because digital media is a fusion of multimedia with technology, the departments and centers listed below cultivate the knowledge base

of artists, writers, animators, graphic designers, content developers, programmers, interface designers and others who are necessary for building the multimedia aspects of digital technology product development.

The following examples of digital media research and training capacities across a broad set of non-engineering disciplines at the campus level show the range of UC's efforts in digital media:

**Figure 4-20.**  
**Digital Media-affiliated Departments and Centers by Campus**

<b>Campus Departments</b>	<ul style="list-style-type: none"> <li>▪ Berkeley Department of Art Practice</li> <li>▪ Irvine Claire Trevor School of the Arts</li> <li>▪ UCLA Department of Design and Media Arts</li> <li>▪ UCLA Department of Film, Television and Digital Media</li> <li>▪ Riverside Art Studio Department</li> <li>▪ Riverside Film and Visual Culture Department</li> <li>▪ San Diego Department of Visual Arts</li> <li>▪ San Diego Interdisciplinary Computing in the Arts Major (ICAM)</li> <li>▪ Santa Barbara Extension Digital Media Convergence courses and Digital Arts degree/certificate</li> <li>▪ Santa Barbara Art Studio Department</li> <li>▪ Santa Barbara Media Arts and Technology Program</li> <li>▪ Santa Cruz Film and Digital Media Department</li> </ul>
<b>Campus Centers</b>	<ul style="list-style-type: none"> <li>▪ Berkeley Consortium for the Arts</li> <li>▪ Berkeley Art Museum/Pacific Film Archive</li> <li>▪ Berkeley Multimedia Research Center</li> <li>▪ Davis Instructional Technology and Digital Media Center</li> <li>▪ Irvine Beale Center for Art and Technology</li> <li>▪ UCLA FTV Laboratory for New Media</li> <li>▪ UCLA Center for Digital Arts</li> <li>▪ UCLA Center for Digital Humanities</li> <li>▪ Riverside Media Library</li> <li>▪ Riverside California Museum of Photography</li> <li>▪ Riverside Center for Technology Development</li> <li>▪ San Diego Center for Research in Computing and the Arts</li> <li>▪ Santa Barbara Center for Digital Innovation</li> <li>▪ Santa Cruz Media Arts Department</li> </ul>





## **ECONOMIC APPENDICES**



# A. Methodology and Data Explanations— Cluster Analysis

## Brief Methodology

The initial cluster analysis was primarily intended to confirm and quantify what all Californians intuitively know: the state is a leader in several technology-focused, “knowledge based” industries that drive our economic growth. Anecdotal evidence about the relative strength of Silicon Valley’s computers and information technology industries and San Diego’s biotechnology industry abounds, and the analysis served as a way to determine the extent of these regions’ competitive advantage. However, it also served to identify other dynamic regional industry clusters within the state that are less celebrated and justify a sustained focus on these clusters.

The following economic indicators were analyzed in-depth:

- Employment and Annual Pay Data: April 2002 Economy.com dataset derived from Bureau of Labor Statistics data.
- Location Quotient Rankings: ICF Consulting’s calculations derived from Economy.com data; see exhibit below.
- Productivity Data: ICF Consulting’s calculations derived from Economy.com data.
- Business establishments data: Dun & Bradstreet CD-ROM (1999).

California’s major metropolitan economic regions—the Bay Area, Greater Los Angeles, Sacramento and San Diego—were benchmarked against the other 41 largest metropolitan regions in the nation in terms of cluster employment levels, growth and location quotient, a measure of employment concentration relative to the national average. Each of the 45 regions was given a ranking in each of 18 different cluster groupings.

**Figure A-1.**  
**Benchmark Regions Used for Cluster Analysis**

Albuquerque, NM	Dallas, TX	Miami, FL	Portland, OR
Atlanta, GA	Denver, CO	Milwaukee, WI	Raleigh-Durham, SC
Austin, TX	Detroit, MI	Minneapolis, MN	St. Louis, MO
Baltimore, MD	Hartford, CT	Nashville, TN	Salt Lake City, UT
Boise, ID	Honolulu, HI	New Orleans, LA	San Antonio, TX
Boston, MA	Houston, TX	New York, NY	Seattle, WA
Charlotte, NC	Indianapolis, IN	Norfolk, VA	Tampa, FL
Chicago, IL	Jacksonville, FL	Orlando, FL	Tucson, AZ
Cincinnati, OH	Kansas City, MO	Philadelphia, PA	Washington, DC
Cleveland, OH	Las Vegas, NV	Phoenix, AZ	Wichita, KS
Columbus, OH	Memphis, TN	Pittsburgh, PA	

### What is a location quotient?

The LQ is a ratio of regional employment share to national employment share in a given cluster.

$$\text{LQ} = \frac{\text{Employment in Cluster in Region/Total Employment in Region}}{\text{Employment in Cluster in U.S./Total Employment in U.S.}}$$

A cluster with a location quotient above 1 is relatively concentrated within a region.

It should be emphasized that the cluster analysis did not exclude any industries because they are not “high tech;” on the contrary, data was analyzed and benchmarked for **all** industries. The cluster groupings that were examined included: aerospace, biosciences, chemical products, computers and semiconductors, education, electric equipment, entertainment, financial services, food processing, health services, information technology, machinery, metals, petroleum products, telecommunications, transportation and logistics, and wood products. After the statistics were generated and average rankings calculated, ***California’s six strongest clusters were determined to be the following: aerospace, biosciences, computers and semiconductors, media and entertainment, information technology and telecommunications.***

The media/entertainment cluster receives specific inputs from some UC campuses, but the relationship between UC and the cluster is not as well defined as it is for the other clusters we emphasized in the analysis. Although the media/entertainment cluster was not analyzed, its identification as an important California cluster provided the basis for including UC contributions to digital media-related areas in the technology impacts chapter.

Because the cluster analysis was based on metropolitan area data, we did not profile the state’s agriculture cluster in the initial economic analysis. However, the importance of agriculture to California’s economy was not overlooked, and this cluster was discussed in the food, nutrition and agriculture impact chapter.

## Cluster Definitions

Industry clusters were defined at the four-digit Standard Industrial Code (SIC) level. The SIC codes and industry names for each cluster are:

### Information Technology

- Custom Computer Programming Services (7371)
- Prepackaged Software (7372)
- Computer Integrated Systems Design (7373)
- Data Processing and Preparation (7374)
- Information Retrieval Services (7375)
- Computer Related Services, not elsewhere classified (7379)

### **Computers and Semiconductors**

- Electronic Computers (3571)
- Computer Storage Devices (3572)
- Computer Terminals (3575)
- Computer Peripheral Equipment (3577)
- Printed Circuit Boards (3672)
- Semiconductors (3674)
- Electronic Connectors (3678)
- Electronic Components, not elsewhere classified (3679)
- Magnetic and Optical Recording Devices (3695)

### **Biosciences**

- Medicinals and Botanicals (2833)
- Pharmaceutical Preparations (2834)
- Diagnostic Substances (2835)
- Biological Products, except Diagnostics (2836)
- Surgical and Medical Instruments (3841)
- Electromedical Equipment (3845)
- Medical Laboratories (8071)
- Commercial Physical Research (8731)

### **Telecommunications**

- Telephone and Telegraph Apparatus (3661)
- Radio and TV Communications Equipment (3663)
- Communications Equipment, not elsewhere classified (3669)
- Search and Navigation Equipment (3812)
- Radiotelephone Communication (4812)
- Telephone Communication, except Radio (4813)
- Telegraph and Other Communications (4822)
- Communication Services, not elsewhere classified (4899)

### **Aerospace**

- Aircraft (3721)
- Aircraft Engines and Engine Parts (3724)
- Aircraft Parts and Equipment, not elsewhere classified (3728)
- Guided Missiles and Space Vehicles (3761)
- Space Propulsion Units and Parts (3764)
- Space Vehicle Equipment, not elsewhere classified (3769)



## **B. The REMI Model and California Economic Forecasts**

The Regional Economic Models, Inc. (REMI) model incorporates time series of historical data about the U.S. and California regional economies over the last three decades. Economic and demographic variables are grouped into five “blocks” that interact simultaneously to produce the model’s outputs. The output block consists of variables relating to output and final demand by industry, including exports, commercial projects, and agricultural, consumer, and government demand. The supply block consists of population and labor supply variables, while the demand block consists of employment demand by industry and occupation. The market shares block includes regional market shares of total U.S. output and exports by industry; and the wage rates block includes information on wages, input prices and profits by industry.

REMI generates a control (baseline) forecast that incorporates the relationships among the historical data series. Economic impacts are examined by comparing simulation forecasts (which include one or more changes in the input variables) with the control forecasts. The REMI model has been used and continuously refined since 1980. Its control forecasts have been documented and tested by experts around the country, and they are highly regarded for meeting the most stringent professional standards.

The structure of the REMI model allows the user to trace the effect of an imposed variable (e.g., the employment level of a university, or the wages paid to university staff) on each of the variables in the model. In all, the model produces 50 tables covering approximately 2,000 variables contained in the five economic and demographic blocks. For this initial analysis of the direct impacts of campus operations, the variables to be examined consist solely of the basic macroeconomic indicators, including Gross Regional Product (GRP), employment, Real Personal Disposable Income and Average Wages. Finer industry detail is incorporated in subsequent chapters of this report as we trace the impacts of industry-specific research programs and departments on California’s economy.

### **10-Year Forecast Period**

The campus-operations growth projections were run through 2011, which corresponds to UC’s 2011-12 academic year. UCOP Planning and Analysis has forecasts for student and faculty expansion at all campuses through this time period.

### **Geographic Detail**

Economic impacts were examined at the level of the metropolitan region because almost all UC staff and students live, work and study not only within the borders of the same city or county in which a campus is located, but rather within the larger

metropolitan area or commutershed. Similarly, a significant share of UC procurement typically involves vendors that are located in the larger metropolitan area—the 2001 economic impact report for UC Berkeley, for example, found that approximately 42% of university expenditures other than wages and salaries were paid to Bay Area vendors. The regional perspective will also be appropriate elsewhere in this report because the relationship of UC campuses to industry clusters does not end at the city limits; industry clusters develop within metropolitan regions, adjusting to the geography supplier networks and a labor force that is not uniformly distributed.

## The Regions

**Bay Area (10 counties):** Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma Counties.

**Central Valley (18 counties):** Amador, Calaveras, El Dorado, Fresno, Kings, Madera, Mariposa, Merced, Nevada, Placer, Sacramento, San Joaquin, Stanislaus, Sutter, Tulare, Tuolumne, Yolo, Yuba Counties.

**San Diego (1 county):** San Diego County.

**Greater Los Angeles (6 counties):** Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, Ventura Counties.

UC Berkeley, UC San Francisco and UC Santa Cruz’s impacts were modeled with the Bay Area’s economy as the baseline. UCLA, UC Irvine, UC Riverside and UC Santa Barbara’s impacts were modeled with the Greater LA economy as a baseline. San Diego County’s economy was the baseline for UC San Diego, and the Central Valley’s economy was the baseline for UC Davis.

## REMI Baseline Forecasts

REMI’s baseline regional forecasts are calibrated to a U.S. forecast that projects an average real GDP growth rate of 2.65% over the next decade, approximately equivalent to the national historical average over the past four decades. Population growth slightly exceeds employment growth over the period because the model assumes that the relatively low unemployment rate prevailing in 2001 was slightly below the sustainable or “natural” level. An estimate of labor productivity can be inferred by subtracting the growth rate of employment from the growth rate of gross regional product. For the U.S., this number is a relatively high (by historical standards) 2.02%.



**Figure B-1.  
REMI Baseline Forecast for the U.S. Economy**

<b>Economic Series</b>	<b>2002 (Estimate)</b>	<b>2011 (Projection)</b>	<b>Annualized Percent Change</b>
Population	280.3 million	302.5 million	0.85%
Employment	173.0 million	183.0 million	0.63%
Gross Regional Product (Fixed 1992 dollars)	9.08 trillion	11.48 trillion	2.65%
Price Index (Inflation)	122.82	149.25	2.19%
Wage Rate	\$29,961	\$43,186	4.14%

The Bay Area's population is projected to grow more slowly than that of the U.S. and that of the other regions in California. REMI uses county-level demographic information and recent migration patterns to calculate the growth rates. Despite the low population growth, Real Gross Regional Product is projected to average 3.35% over the next decade. Subtracting employment growth of 0.49% from this figure implies an average labor productivity growth rate of 2.86%, unusually high by historical standards but consistent with recent numbers, especially in high technology manufacturing. Wage rates are expected to grow at a pace that will keep the Bay Area's wages significantly higher than wages in the other California regions.

**Figure B-2.  
REMI Baseline Forecast for the Bay Area Economy**

<b>Economic Series</b>	<b>2002 (Estimate)</b>	<b>2011 (Projection)</b>	<b>Annualized Percent Change</b>
Population	7.05 million	7.45 million	0.57%
Employment	4.79 million	5.05 million	0.49%
Gross Regional Product (Fixed 1992 dollars)	354.95 billion	480.25 billion	3.35%
Price Index (Inflation)	143.54	175.40	2.25%
Wage Rate	\$43,932	\$64,831	4.39%

Greater Los Angeles, by far the most populous region in California, is expected to grow in population by almost 9% over the next decade. Employment growth is projected to slightly exceed population growth, and Real Gross Regional Product will average an impressive 3.24% growth, 0.6% higher than the U.S. average. Labor productivity will grow by approximately 2.18%, not nearly as high as the Bay Area's, but still a healthy figure. The wage rate varies greatly by county within the region, but the average is expected to grow by 4.4% annually over the next decade.

**Figure B-3.**  
**REMI Baseline Forecast for the Greater Los Angeles Economy**

<b>Economic Series</b>	<b>2002 (Estimate)</b>	<b>2011 (Projection)</b>	<b>Annualized Percent Change</b>
Population	16.68 million	17.95 million	0.80%
Employment	9.77 million	10.68 million	1.06%
Gross Regional Product (Fixed 1992 dollars)	587.64 billion	777.06 billion	3.24%
Price Index (Inflation)	122.48	156.81	2.27%
Wage Rate	\$31,041	\$45,745	4.40%

San Diego's population is expected to grow slightly more slowly than that of Greater LA, but faster than the Bay Area's population. Subtracting the employment growth rate from the growth in Real Gross Regional Product implies a labor productivity growth of 2.39%, a high figure that is most likely boosted by the presence of telecommunications manufacturing and biotech industries.

**Figure B-4.**  
**REMI Baseline Forecast for the San Diego Economy**

<b>Economic Series</b>	<b>2002 (Estimate)</b>	<b>2011 (Projection)</b>	<b>Annualized Percent Change</b>
Population	2.91 million	3.14 million	0.85%
Employment	1.77 million	1.93 million	0.97%
Gross Regional Product (Fixed 1992 dollars)	110.19 billion	148.10 billion	3.36%
Price Index (Inflation)	126.89	155.29	2.27%
Wage Rate	\$29,208	\$42,735	4.31%

In terms of population, the Central Valley will be the fastest growing region in the state over the next decade. Nevertheless, its Real Gross Regional Product will slightly lag behind most other regions. Labor productivity will grow at a respectable 2.19%, not as quickly as in the high-tech areas of the Bay Area and San Diego. Wage rates will continue to lag behind the rest of the state. It is important to recognize that since the Sacramento metropolitan area is included in the largely rural Central Valley, average wages are more unevenly distributed than in other regions.

**Figure B-5.  
REMI Baseline Forecast for the Central Valley Economy**

<b>Economic Series</b>	<b>2002 (Estimate)</b>	<b>2011 (Projection)</b>	<b>Annualized Percent Change</b>
Population	5.75 million	6.29 million	1.01%
Employment	3.01 million	3.30 million	1.07%
Gross Regional Product (Fixed 1992 dollars)	152.38 billion	202.62 billion	3.26%
Price Index (Inflation)	115.28	140.47	2.22%
Wage Rate	\$23,089	\$33,362	4.17%

**Figure B-6.  
REMI Baseline Forecast for the California Economy**

<b>Economic Series</b>	<b>2002 (Estimate)</b>	<b>2011 (Projection)</b>	<b>Annualized Percent Change</b>
Population	33.83 million	36.33 million	0.77%
Employment	20.13 million	21.80 million	0.91%
Gross Regional Product (Fixed 1992 dollars)	1.24 trillion	1.65 trillion	3.25%
Price Index (Inflation)	130.25	159.18	2.25%
Wage Rate	\$33,840	\$49,774	4.37%



## C. Methodology and Data Explanations— UC Spending Impacts

### Quantitative Modeling of Expenditure Impacts

Because the spending impacts are meant to quantify only the immediate effect of UC employment, wages and salaries and expenditures on the surrounding economy, the modeling regards the economic activity of UC employees and expenditures as indistinguishable from other economic actors within the regional and statewide economies. In other words, it disregards the added economic value of expenditures on basic and applied university research, which generate disproportionately high economic returns, particularly in the long term. Each dollar of expenditure on research and development tends to have a much more significant impact on an economy than a dollar of consumption expenditure; thus, the economic “multiplier” on research activity is much higher than that on consumption. The incremental value obtained through expenditures on research may include the development of entirely new companies or industries based on a technological innovation or improvements in productivity due to automation. The technology impact chapter analyzes the dynamic benefits of UC research.

### Geographic Detail

The statewide level captures the impact of each campus on its surrounding region and all of the other regions in California. While most of the impacts are concentrated in the region, there are interregional effects modeled by REMI, which captures each campus’ broader expenditure impact on the state. The interregional effects reflect the geographical spillover effects of economic activity in the state due to factors such as interregional commerce and travel.

### Data Sources for Spending Impact Simulations

Current and projected **student enrollment figures** were provided by the UCOP Budget Office in “General Campus Budgeted FTE Enrollment Growth through 2010-11—Undergraduate and Graduate Splits,” dated January 10, 2002. The numbers entered into the model for each campus are based on the aggregate of undergraduate and graduate students enrolled. (The figure encompasses general campus student populations and excludes other minor student pools. These additional pools would have a negligible effect for the projected macroeconomic impacts of UC.) In the first simulation, this number was deflated by a factor of 0.5 for each campus, the assumption being that approximately half of the students attending the school come from outside the region in which the campus is located. For UC Berkeley, this is the case, but for other campuses, which serve a more local population, the figure should be deflated further. *Nevertheless, the value of this deflator has a negligible effect on the overall macroeconomic results of the simulation because the contribution of the student population is dwarfed by campus*

*expenditures.* Removing students from the region reduces the region’s total disposable income and results in negative impacts to all macro variables.

Another table produced by the UCOP Budget Office provided current numbers and projections of net growth in the faculty at each of the UC institutions. However, this table did not include projected growth of other staff. The UCOP Office of Planning and Analysis confirmed that number of staff FTE (full time equivalent employees) tends to grow at the same rate as the growth of the faculty, so this assumption was incorporated into the projected total employment growth numbers for the campuses. Actual **total FTE employment** through 2011 was calculated by applying this growth rate to the actual 2001-02 numbers for each campus from the Fall 2001 “Statistical Summary of Students and Staff” prepared by the UCOP Department of Information Resources and Communications. All employees were assumed to live in the region in which the campus is located, so the total number was subtracted in the REMI model. This is a reasonable assumption because the actual percentage living in the campus region is higher than 90% for each campus.

**Total wages and salaries** through 2011-12 were calculated using the actual wages and salaries expenditure figures from the 2000-01 Campus Financial Schedules and applying a growth rate equal to the growth rate of FTE staff plus an average inflation rate of 3% per year. The total wages and salaries number was not deflated before it was entered into the model for the same reason that total employment was not deflated—almost all wages and salaries (over 90% for each campus) stay within the region in which the campus is located.

The Campus Financial Schedules include breakdowns of expenditures by source and by distribution of funds (Wages and Salaries and Other Expenditures). Wages and salaries were entered directly into the model, independent of source, but for other expenditures we enter the contribution of state and local government, the federal government, and other sources (which we lump into an educational services sales variable) separately. We do this to capture the larger multiplier effect that results from funds coming from outside of the region. UC funnels federal money into the regional and statewide economies, which facilitates economic growth more directly than the recycling of local dollars.

Other expenditures are assumed to grow at the rate of growth of the student population plus inflation (assumed to be 3% per year). We use base figures from the Campus Financial Schedules and multiply them by this rate.

Unlike wages and salaries, other expenditures are not captured completely within the region in which the campus is located. In fact, the most recent campus impact report (UC Berkeley in 2001) reported that only 42% of “other expenditures” remained in the Bay Area. We ran two versions of the model: one in which 50% of other expenditures are captured in the region (as an upper limit of economic impact), and one in which only 25% of these expenditures are paid in the region (as a lower limit). Numbers for state and local government spending, federal spending and other sales of educational services are deflated by these respective percentages in the two model runs.

## Multiplier Effects: Indirect Impacts of UC Spending

The impact of the nine existing UC campuses in their regional economies and the statewide economy is the result of direct spending by the university and its students, in addition to the indirect and induced spending in the economy of UC expenditures. The indirect and induced effects represent the number of times each dollar initially spent by the university, including by students and employees, “multiplies,” or cycles, through the economy, generating income, jobs and tax revenues. ICF Consulting estimated the magnitudes of these multiplier effects of direct UC spending using REMI. Because of the difficulty of measuring multiplier effects, all models have limitations. However, REMI provides a credible approximation of economic and government fiscal impacts generated by a given amount of UC’s direct expenditures at the regional and statewide levels.

The input-output coefficients in REMI are uniquely defined for each region based on the magnitude of economic activity in various industrial sectors, including assumptions made about the spending patterns of various segments of the regional population. Therefore, there will be differences in the multipliers among campuses in different regions due to differences in these REMI regional coefficients. The campuses in larger metropolitan regions have greater average multiplier effects because they are located in regions with a higher magnitude of regional economic activity. Thus, campuses in the Greater LA region—UCLA, UC Riverside, UC Santa Barbara and UC Irvine—have the highest average multipliers, followed by those in the Bay Area. UC San Diego and UC Davis have smaller multipliers because they are located in regions with relatively smaller economic activity.

However, it is more important to focus on the multiplier range than an absolute figure, which can only be an estimate at best. The multipliers for UC in the upper-limit regional scenario ranged from 1.03 to 1.65, and 1.06 to 1.75 in the lower-limit regional scenario, indicating that expenditures in the region have significant incremental impacts through business and consumer spending cycles. These figures are calculated by dividing the real GRP impacts by campus expenditures. Moreover, each campus’s expenditures are further amplified at the statewide level.

## Results of Spending Simulations

Tables in Chapter 2 present upper and lower estimates of the magnitudes of the various impacts of the nine existing UC campuses on gross product, real disposable personal income, government revenue and job creation in 2002 and through 2011 at the regional (Bay Area, Central Valley, San Diego, Greater LA) and statewide level (all regions in California). The first set of tables shows the results of the simulation in which 50% of each of the campus’s non-wage expenditures were spent in the home region of each campus, while the results in the second set of tables are from the simulation in which only 25% of the campus’s non-wage expenditures were spent in the home region.

## Alternative Simulations

In the scenario in which each campus is removed from the regional economy in 2002, the model moves toward a new equilibrium through the forecast period. Aggregate real gross domestic product and real disposable income losses are presented, in addition to the reduction in regional employment that would result in 2011 if the campus no longer existed. As is evident from the tables, although the initial employment shock in 2002 mitigates over time, there is still a persistent, significant negative effect on the baseline forecast that provides a consistent drag on the economy.

Chapter 2 shows the results of a simulation that is much more realistic than the previous one. In this simulation, campus expenditures are frozen at 2002 levels over the entire 2002-11 period. The student and faculty populations are not allowed to grow, and spending does not keep pace with inflation. The differences presented in this table compare the flat spending scenario to the scenario in which spending grows at the rate of the student population plus inflation. In this simulation, 50% of non-wage campus expenditures are spent in the home region (upper-limit).

Note that UC Irvine, the campus expected to grow the fastest over the period, would be responsible for the largest share of the employment loss. UC Berkeley, a relatively large campus that is not expected to grow as quickly, would represent only a small share of the economic and employment loss. These facts emphasize the point that the losses presented in Chapter 2 represent the *difference between the flat spending scenario and the projected growth scenario for each campus*.

It is also important to note that the results of the alternative simulations are only presented at the regional impact level. Of course, statewide economic losses would be slightly higher than these figures.



## **D. Methodology and Data Explanations— Workforce Impacts**

### **Data and Trends on Student Enrollment and Degrees Conferred**

The workforce impacts emphasize fields of study related to the industry clusters identified during the cluster analysis. These clusters include agriculture, biosciences, computers and semiconductors, and information technology. Because there is considerable overlap among these clusters, we aggregated student enrollments in computer science and engineering disciplines to account for study related to computers and semiconductors and information technology clusters. Similarly, health sciences and biological sciences enrollments were aggregated to estimate the biosciences-related enrollments.

The information presenting agriculture enrollments in the report and in Appendix H includes only those students who are enrolled specifically in agriculture and natural resources programs, not in overlapping biosciences. Thus, the agriculture enrollments underestimate agriculture-related study at the campuses for which data is presented. For example, it is likely that a large share of the biosciences studies at UC Davis correspond with the study and research of agricultural bioscience. The enrollment information was taken from the UCOP Statistical Summary of Students and Staff (Fall 2001).

Enrollment statistics provide an indication of the composition of the total undergraduate student body, but it does not necessarily reflect the number of students who actually graduate in each major. This is the case because undergraduate students may not be able to specify a major at time of enrollment, may switch majors while enrolled, or declare a major which is different from their initial enrollment intention. Therefore, the actual number of undergraduates enrolled may be different from the actual number of undergraduate students who have the declared the major. While we do not have data on the total number of undergraduate students declared in the major in any given year, we will present data on degree conferrals for this population. One can use the combination of the enrollment data and the following undergraduate degree conferrals data to ascertain the composition of the undergraduate student's body intended course of study. For the graduate student population, enrollment information accurately portrays the composition of the number of students in the major since enrollment is department-specific.

### **How Degrees Translate into Employment**

We use the statistics on the number of science and engineering graduates who continue on to science and engineering careers in the U.S. as a whole to make assumptions for inputs into the REMI model (<http://www.remi.com/>) described in the

education and workforce impact chapter. We also use the results of senior student and alumni surveys that ask about employment by field.

### ***From Enrollment to Employment***

To calculate an estimate of the UC undergraduate impact on California’s cluster workforce, it was necessary to determine how many science and engineering graduates actually pursue careers in science and engineering. The National Science Foundation presents survey results in its publication “Science and Engineering Indicators 2002.” The NSF reports that, in 1999, there were approximately 10.5 million people in the U.S. workforce with at least one science and engineering degree. Of these people, approximately five million *do not* work in science and engineering (S&E) occupations, but this does not necessarily mean that their S&E training goes to waste. Of the five million S&E degree-holders performing non-S&E jobs in 1999, 67.3% indicated that they were employed in a field at least *somewhat* related to the field of their highest S&E degrees. For those with bachelor’s degrees, many go directly into master’s and Ph.D. programs as opposed to the workforce. This would primarily account for the lower percentage of bachelor’s degree holders in the S&E workforce. Appendix H presents data about the S&E nature of the occupations held by S&E degree holders.

### ***Residence and Occupation Information***

Recent alumni data that was available from the UC campuses at Berkeley, Riverside, Irvine, Davis, San Diego and Santa Cruz could be slightly skewed because they are based on alumni responses, and alumni living in California may be more likely to respond to such surveys and questionnaires. Also, campuses use information of alumni residence provided by their alumni associations. Not all graduates become or remain active members of the alumni associations. Based on the information we were provided, however, one can assume that most of the UC graduates systemwide reside in California. In fact, according to a National Science Foundation survey of earned doctorates, two-thirds or more of UC Ph.D.’s in engineering/computer sciences or professional fields intend to remain in California. The alumni-based data is summarized in Appendix H. For modeling below, we assume that 70% (the average of these numbers) of undergraduate and graduates degree-earners in science and engineering reside in California.

## **Modeling the Economic Impact of UC Alumni on California’s Clusters**

Using Regional Economic Models, Inc. (REMI), we quantified the impact of cluster employees with UC degrees on the regional and statewide economies. We were not attempting to capture the incremental value of research (as we did in the technology impact chapter) or quantify the economic value of UC-affiliated start up companies. Rather, we tried to illustrate how UC graduates in cluster-related fields over the next decade will contribute to output in their respective sectors, and how this will impact the overall economy.

## ***Undergraduate Student Impact***

We used data provided by the UC Office of the President to model the impact of graduating students with bachelor's degree in cluster-related fields. The data gives the number of undergraduate students who graduated with cluster-related degrees in 2001. It also includes UCOP estimates of the number of baccalaureate degrees to be awarded in 2011 in cluster-disciplines based on current degree-enrollment ratios and projected enrollment data (see Appendix H).

To get the number of students who graduate each year with cluster-related degrees, we took the 2001 and 2011 data and calculated the 10-year percent change. We used these numbers to calculate an average annualized percent growth of 2.8% in science and engineering degrees awarded between 2001 and 2011. For the calculations in this section, we assume that undergraduate degrees in these disciplines increase systemwide at the same rate over the next decade—2.8% per year (average annualized percent).

We chose to use a growth rate based on systemwide, aggregate cluster-related numbers because the growth rates at the individual schools and in each department varied dramatically over the period. Some of the enrollment growth rates in computers and IT between 1996 and 2001 are clearly unsustainable; at many campuses they exceeded 100% over the five-year period. While some of the smaller campuses may possibly match this rate over the next few years, it is more likely that these gains will not be as large in percentage terms.

We separated out graduate students for several reasons. The growth rate of the graduate student population is much more dependent on the growth rate of the faculty in each department than on the growth of clusters and economic opportunities. Graduate students with science and engineering (S&E) degrees also enter the S&E workforce at a different rate than people with undergraduate S&E degrees, and they earn higher and more widely distributed salaries. Including both populations in the calculations would have made them unnecessarily complex.

Of the 8,493 UC undergraduates who received degrees in biosciences, agriculture, engineering, and IT programs in 2001, we calculated that approximately half of these students (approximately 4,247) obtained a job directly related to their field of study, based on the NSF discussion on S&E degree-holders above. Of the 4,247 entering the S&E workforce, we estimated that 70% of them stay in the state of California after graduation based on the alumni residence information in the previous section. Thus, 2,973 students entered California's S&E workforce in 2001.

We assume that these graduates are generally willing to move anywhere in the state to obtain work. To calculate the percentage of graduates that will work in each region, we examined employment numbers in the Engineering Services sector of the economy, as a proxy for all of the industries related to the agriculture, biosciences, computers and semiconductors, and information technology clusters. The 187,871 people in the Bay Area, Central Valley, Greater Los Angeles and San Diego regions employed in Engineering Services are distributed as follows: 80,457 (42.8%) in Greater LA; 66,444 (35.4%) in the Bay Area; 23,042 (12.3%) in San Diego; and

17,928 (9.54%) in the Central Valley. We multiplied the number of graduates finding work in S&E fields in California by each region's estimated share of S&E employment. This yielded 1,051 graduates entering the Bay Area workforce; 1,273 graduates entering the Greater LA workforce; 365 graduates entering the San Diego workforce; and, 284 graduates entering the Central Valley workforce. We performed the same calculations for each year through 2011 to yield the results that can be found in Appendix H.

The next step was to multiply these employment numbers by a measure of output per worker to calculate the direct impact of these UC graduates on the economy. Output per worker in the Engineering Services sector varies by region. This figure was taken from REMI's baseline forecasts for the regions. Because inexperienced people entering the workforce would not be expected to contribute the average output per worker in their first years, this number is deflated by 0.2 to produce a more reasonable estimate of their output.

After the direct impact numbers were calculated, these were fed into the model in order to capture the multiplier effect (indirect impact) throughout the regional economies. The results (direct + indirect impacts) are summarized in the document as well as detailed in tables in Appendix H.

The results of the REMI simulation present the economic impact of only those UC undergraduates who are graduating this year and who will enter the workforce in a science or engineering-related position. It does not include the impact of UC-educated scientists and engineers already in the workforce; calculating this number would involve too many assumptions and the final result would be spurious. An important fact to note here is that the numbers presented in the table above do not represent an incremental boost to the regional economies that could be provided only by UC graduates. If UC were not producing these undergraduate scientists and engineers, many could possibly be supplied to the regional workforce by other national or international institutions, and these workers would have similar economic impacts. *However, the fact that there is a highly skilled pool of scientists and engineers being trained by the UC system does give the clusters in California a competitive advantage over those in competing regions, and this provides an incremental benefit to the state economy.*

### **Graduate Student Impact**

The calculations were based on 2001 degree-awarded data and 2011 systemwide projections for masters and Ph.D. students provided by UCOP Graduate Education Planning and Analysis Division. As used for the undergraduate impact, we extrapolated these numbers between 2001 and 2011. The average annualized percent growth in science and engineering degrees awarded between 2001 and 2011 is 6.0%.

Of the 2,235 graduate students receiving degrees in bioscience, agriculture and IT/engineering, we next determined the number of them who work in science and engineering fields. From the NSF data discussion, 67.8% of students who received a master's degree are employed in a "closely-related" field; 73.6% of students who

received a Ph.D. are employed in a “closely-related” field. In this particular NSF data, science and engineering post-secondary teachers are included. Based on another set of NSF data which details U.S. scientists and engineers by detailed occupation and highest degree attained, we were able to isolate only those degree holders who are employed in industry so as to get a more accurate projection of graduate student impacts on economic productivity. For those with master’s degrees who are employed in a “closely related field,” 8% are occupied as post-secondary teachers; at the doctorate level, 43% are occupied as post-secondary teachers. Presumably, the 43% reflects the significant number of Ph.D. graduates who become professors.

We deflated the first set of National Science Foundation data by 8% and 43%, respectively, to get 59.3% of master’s degree-holders and 30.8% of Ph.D. degree holders working in “closely related” non-teaching fields, as shown in Appendix H. Because we aggregated master and doctorate graduate data, we took the average of 59.3% and 30.8% to get 45%. In 2001, 45% of the 2,235, or 1,006, science and engineering graduates entered occupations in degree-related industries. Of the 1,006 graduates entering the science and engineering workforce, we estimate that 70% of them (704) remain in the state based on the discussion of alumni residence statistics.

Again, we made the same assumptions about graduate students’ willingness to work anywhere in California as we did for undergraduates. We followed the same methodology in the “Undergraduate Student Impact” section to determine the distribution of graduate students in the four California regions based on each region’s estimated share of employment. In 2001, the distribution was: Bay Area (249), Greater Los Angeles (302), San Diego (86) and Central Valley (67). We extrapolated these calculations through 2011 based on the 6.0% annualized growth rate in UC science and engineering graduate degrees awarded between 2001 and 2011 (see Appendix H).

The same methodology was then used to determine the direct and indirect impacts of these UC graduates in the regional economies in which they work. In this case, we did not deflate the average output per worker given that the graduate students represent a wide range of experience and abilities, whose productivity likely averages out to the average output per worker predicted in REMI’s baseline forecasts. The number of students entering the science and engineering workforce and their total output in each region was fed into REMI. The results of the graduate student impact are in the report and detailed in the tables in Appendix H.

## **Community College Transfers to UC**

While Chicano/Latino community college transfer admissions have increased across the board, American Indian and Black/African American community college students have seen very limited gains in access to UC. In fact, the trends for American Indian and Black/African American students have not been uniform across campuses. Even where there has been an increase, the magnitude of admissions remains very low relative to other populations. However, it is possible that the number of American Indian and Black/African-American applicants from community colleges is lower than

other groups, and that, out of those who have applied, admission rates have been high. But, without data on the number of community college applicants by ethnicity, this is not conclusive.

It should be noted that the statistics only reflect admissions of California residents as opposed to all transfer admission from California community colleges. However, these figures are statistically significant since they capture over 90% of the admissions. The remainder most likely accounts for foreign student transfers. Secondly, fall-term statistics only reflect a portion of the community college transfers into the UC system. In fact, a number of students from California community colleges are admitted throughout the academic year. However, we were unable to access this data.

The full “Critical Path Analysis of California’s Science and Technology Education System” report released in April 2002 by the California Council on Science and Technology provides valuable survey-based information on industry workforce development. It looks at the California education system as a whole, and in certain sections it emphasizes UC’s role in educating scientists and engineers over the roles of private institutions. Lee and Walshok’s piece on the extension system is included in the report along with chapters on K-12 education, the digital divide, and degree production at all levels of university education. UC contributors to the report include Julian Betts at UC San Diego and Michael Darby and Lynne Zucker of UCLA, who benchmarked California’s science and technology base to that of other “high-tech” states.

## **Continuing Education and Skills Upgrading**

The National Center for Education Statistics show that persons in the 40–44 age group enrolled in the largest number of career or job-related courses in 1999, followed by the 35 to 39 age group. The data indicated that adult education participation increases with income bracket and that a majority of students are enrolled in continuing education for career-related or part-time higher education purposes. In 1999, the data showed that the percentage of adults participating in career or job-related courses was positively correlated with income. The percentage of adults engaged in continuing education for part-time higher education purposes increased slightly as income reached \$40,000 and decreased thereafter. A smaller fraction of adults are enrolled for personal interest, and their numbers tended to increase with income. One would expect this to be the case for courses taken for personal interest since those with more income can afford to spend on leisure activities and tend to have more leisure time.

## **Training Innovators and Entrepreneurs**

In the technology impacts chapter, we presented information about UC spin-off companies that fell under the narrow definition of the UCOP Office of Technology Transfer. These spin-offs were started after the execution of a UC technology licensing agreement. However, these companies are only a small subset of the companies that could truly be considered “UC start-ups”—companies founded by UC



professors or graduates and are not necessarily based on a UC technology. UC San Diego is the campus that has done the most visible work tracking these companies and calculating their employment and economic impact. For UC to be able to fully represent its impact on the state, each campus should implement a program to identify and track these companies.

We analyzed the list of spin-off companies provided to us by the UCOP Office of Technology Transfer. As mentioned in the previous appendix (and in the OTT annual report for 2001), the office has identified 161 companies that are based on a UC technology licensing agreement. (In fact, UC professors and graduate students founded the vast majority of these companies, so the distinction between technology and workforce impacts is blurred here.) Of these 161 companies, 104 have given UC permission to disclose the relationship between the company and the university. The examples presented in this section will be drawn from that list of 104 companies.

OTT lists only eight companies classified as software start-ups and 10 as photonics start-ups. Intuitively, one would expect it to be relatively less complicated to start up a software company than a photonics company, especially considering the capital equipment required for the latter. In fact, it is quite likely that there have been more software than photonics companies started by UC graduates and affiliates, but these companies are not always captured by the OTT's definition of spin-off. *Whereas a technology license agreement may be a prerequisite for the development of a photonics product (or, for that matter, a new drug) that requires a significant upfront capital investment, this is not the case for a software company that is built on some well-written lines of code.* This explains why the numbers may be skewed away from IT and toward health in this sample. What is the true number of software companies started by UC graduates? We believe it is much greater than the number of photonics companies, and it may be possible to answer this question through a collaborative research effort involving the campuses.

### **Revenues**

Revenues alone do not present an accurate picture of a start-up company's economic impact. This is not to say that negative net revenues represent a drag on the economy; on the contrary, the investment generated and the jobs supported by these investment dollars represent significant gains for local and regional economies.

### **Research Partnerships**

Many of the spin-offs on the UC Office of Technology Transfer's lists have been acquired by other companies but still retain their status as independent research subsidiaries. When a company is acquired, it becomes more difficult to trace the economic impact that has resulted from UC technology licensing agreement. Nevertheless, we believe that acquisition activity should be tracked to account for all of the companies that have spun out of UC. Some examples of acquired companies include Neomorphic Software (acquired by Affymetrix), Yuni Networks (Applied Micro Circuits Corporation), Signal Pharmaceuticals (Celgene), Xenometrix (Discovery Partners International), and Serra Pharmaceuticals (Karo Bio).

***Continuing Involvement with UC***

Of course, many of the companies on the UC Office of Technology Transfer list still retain UC faculty as key executives or members of the board of directors, so the informal relationships between these companies and the campuses are numerous and diverse.



## E. Methodology and Data Explanations— Technology Impacts

### Research Expenditures by Field

To calculate the UC campuses’ total research expenditures in the fields related to California’s thriving industry clusters, we used the 2000-01 campus financial schedules to aggregate spending by relevant departments and research centers. A complete list of these departments and research centers, broken down by campus, is presented in Appendix I.

Note: Campus financial schedules classify only direct research expenditures in the research category. Indirect expenditures (lab rental, electricity, etc.), which typically account for approximately one-quarter to one-third of total research expenditures, are not included in these numbers.

The main research categories identified are:

- **IT and Related Engineering (IT/Eng)** which consists of departments and centers that make contributions to research relevant to the Aerospace, IT, Telecommunications and Computers and Semiconductors clusters.
- **Biosciences (Bio)**, including medical research expenditures.
- **Agriculture (Ag)**.
- **Other**, which consists of all non-cluster related university research expenditures.

### Dynamic Economic Impact of UC Research

These calculations took into account all of UC’s current expenditures, from instruction to administration to research activities. As we pointed out in that section, the initial exercise regarded UC’s economic activity as indistinguishable from other economic actors within the regional and statewide economies. In other words, it disregarded the added economic value of expenditures on basic and applied university research, which generate disproportionately high economic returns, particularly in the long term.

For the productivity calculations described below, we use a methodology developed by researchers at the Association of Universities and Colleges of Canada, which is rooted in the new growth theory of economics. Traditional economic models did not explicitly quantify the value of research and development activity and attributed long-term economic growth to only labor and capital. However, new growth theory takes research and development—and its impact on technological change—into account and is thus better able to explain the tremendous economic growth of certain “technopoles” such as Silicon Valley.

To measure the impact of UC research on GDP and jobs, it is first necessary to measure the impact of research on the Total Factor Productivity (TFP) of the economy. TFP is the economic growth that results from increases in the efficiency of labor and the productivity of capital. Much of the improvement in TFP results from advances in society's knowledge and ability to apply this knowledge. As a major conduit of technology transfer and knowledge-building in California, UC contributes to the capital and skills component of TFP.

**Labor Productivity Growth = Total Factor Productivity Growth + Growth in Capital Stock**

**Total Factor Productivity = Improvements in Capital Quality + Improvements in Society's Stock of Knowledge and Skills**

The Regional Economic Models, Inc. (REMI) baseline forecasts allowed us to calculate labor productivity growth rates for California and each of its regions. We used the calculated labor productivity growth rates to develop a rough estimate of TFP growth in California.

**Figure E-1.**  
**REMI Baseline Forecasts Used to Calculate Labor Productivity Growth Rates for California and Its Regions**

Region	Annual Population Growth Rate, 2002-11	Annual Employment Growth Rate, 2002-11	Annual Real GRP Growth Rate, 2002-11	Annual Labor Productivity Growth Rate, 2002-11	Average Annual Wage, 2011
<b>United States</b>	<b>0.85%</b>	<b>0.63%</b>	<b>2.65%</b>	<b>2.02%</b>	<b>\$43,186</b>
California	0.77%	0.91%	3.25%	2.34%	\$49,774
Bay Area	0.57%	0.49%	3.35%	2.86%	\$64,831
Central Valley	1.01%	1.07%	3.26%	2.19%	\$33,362
Greater Los Angeles	0.80%	1.06%	3.24%	2.18%	\$45,745
San Diego	0.85%	0.97%	3.36%	2.39%	\$42,735

The Organization for Economic Cooperation and Development (OECD) reports that nationwide, total factor productivity is responsible for approximately 20% of the growth in gross regional product, or GRP (OECD, Technology, Productivity and Job Creation, Vol. 2, Analytical Report, Paris 1996). For the U.S., this means that TFP is expected to account for GRP growth of  $2.65\% \times 0.2 = 0.53\%$  over the 2002-11 period. Labor productivity is the sum of total factor productivity and the growth in the capital stock. So, for the U.S. over the period 2002-11, growth of the capital stock and improvements in capital quality are expected to account for 2.02% (labor productivity) - 0.53% (TFP) = 1.49% of GDP growth per year. If we assume that

the capital stock and capital quality will grow at the same rate for the U.S. and California (1.49%), we get the following results.

**Figure E-2.**  
**Total Factor Productivity Calculations**

Region	Annual Real GRP Growth Rate, 2002-11	Annual Labor Productivity Growth Rate, 2002-11	Annual Growth in Capital Stock and Capital Quality, 2002-11	Annual Total Factor Productivity Growth Rate, 2002-11	TFP Growth as Share of GRP Growth
United States	2.65%	2.02%	1.49%	0.53%	0.20
California	3.25%	2.34%	1.49%	0.85%	0.26

The Organization for Economic Cooperation and Development (OECD) reports regression results that suggest that research and development expenditures are responsible for 70% of the increases in total factor productivity. So, for California, productivity gains resulting from research and development activities would account for  $0.26 \times 0.7 = 18.2\%$  of the growth in Gross State Product over the next decade.

To determine UC's impact on productivity gains and the growth of Gross State Product, it was necessary to calculate the percentage of UC's total state research and development expenditures. Our calculations show that this number is approximately 7%; that is, **7% of all R&D activity in California takes place at the UC campuses.**

Multiplying 0.18 (the share of GSP accounted for by research and development in California) by 0.07 (UC's share of state R&D), **we find that approximately 1.3% of the growth in Gross State Product can be attributed to productivity gains resulting from the research activities at the University of California.** The estimated impacts of UC research on real Gross State Product and job creation are presented below.

**Figure E-3.**  
**Dynamic Impact of UC Research on Gross State Product Growth, 2002-11**

UC Campus	Estimated Impact on Real Gross State Product Growth Due to Productivity Gains	Estimated Job Creation (assumes 20 jobs/million in expenditures)
Berkeley	\$823 M	16,460
Davis	\$684 M	13,680
Irvine	\$301 M	6,020
Los Angeles	\$996 M	19,920
Riverside	\$157 M	3,140
San Diego	\$991 M	19,820
San Francisco	\$953 M	19,060
Santa Barbara	\$207 M	4,140
Santa Cruz	\$122 M	2,440
<b>Total</b>	<b>\$5.2 billion</b>	<b>104,680</b>

This table reports a flow of how the university's research expenditures will contribute to the growth of the economy over the 2002-11 period. It would be irresponsible and probably impossible to calculate a meaningful current "stock" value for the productivity and Gross State Product impact of all past university research expenditures. This is because UC has not been present in the economy throughout the history of the economy, and its share of statewide research expenditure has not been constant throughout UC's existence.

If we were to calculate the contribution of UC expenditures to real Gross State Product growth over the same 2002-11 period, a simple way to estimate that figure would be to multiply the current stock values reported previously (\$11.6 billion and 206,000 jobs) by 30%, under the assumption that all expenditures will grow at around 3% per year above inflation. The results would be a \$3.5 billion contribution to GDP over the period and 78,000 new jobs.

## Research Expenditures by Source

Examples of "Private Research Contracts and Grants by Campus:" Contract amounts reflect the portion to be used during 2000-01 only, not the total value of the contract.

## Invention Disclosures, Patents, Licenses and Start Ups

The UC Office of the President's Office of Technology Transfer reports the number of invention disclosures by campus in its annual report. (UC researchers are required to "disclose," or formally report, all of their inventions created with UC resources.) We aggregated the number of invention disclosures by campus over the three years between 1998-99 and 2000-01, and then we aggregated the total research

expenditures by campus, reported in the annual financial schedules, over the same period. Dividing the second number by the first provides one measure of “research efficiency” reflecting the number of invention disclosures per research dollar. These numbers can be found in Appendix I.

The numbers of invention disclosures per research dollar are an imperfect indicator of “research efficiency” in that it does not distinguish between the various departments at each campus. For varying reasons, different academic departments and research units would be expected to have higher or lower rates of invention disclosure. In some fields, what qualifies as an invention takes fewer resources to produce than an invention in another field. This is because some inventions merely involve the upgrading of previous technologies. We are awaiting data on invention disclosures by the department from OTT and will include this data in our analysis when it becomes available. Before we have this data it would be premature to comment on the differences in “research efficiency” across campuses.

UC Berkeley’s Office of Technology Transfer was the only office to provide information about licensing activity by department. This information is not readily available from either UCOP or other campus technology transfer departments, although departments at some campuses attempted to aggregate such data for our analysis.

### ***Start-ups***

The UCOP Office of Technology Transfer has identified more than 160 companies that were founded as a result of a technology licensing agreement with the University of California. This is a narrow definition that excludes almost all companies founded by UC graduates. Of these start-ups that fall under this narrow definition, 104 have given permission to disclose this relationship with UC.

We found that the majority of campuses do not have centralized databases tracking start-up companies, whether they fall under OTT’s narrow definition of start-up or a broader definition. UC San Diego has done the most work in this area and we will investigate their techniques to determine if it is feasible to gather the information for other campuses.

## **UC Departments and Centers included in Research Expenditure Calculations**

The cluster approach emphasizes the critical economic foundations that are the ***building blocks of regional prosperity***. In this framework, UC provides inputs to the Human Resources, Technology, and Quality of Life foundations. As a technological foundation, the University of California is building R&D capacity to accelerate technology transfer into higher value-added manufacturing and services. We have identified the research contributions of departments, research centers and institutes that are related to the clusters. Because of the dynamic, integrated, and overlapping nature of research, this list is extensive but not exhaustive. Within academia, there is a research spectrum or value-chain: there are primary

foundations or building blocks for other more applied research areas. Basic sciences such as physics and biology are the building blocks for applications in energy and biotechnology; materials science and engineering is a foundation for electrical and computer engineering. The list in Appendix I identifies campus units that are most directly associated with the clusters, noting that contributions to the clusters technology foundations are also made in the general research areas of engineering and natural and physical sciences.

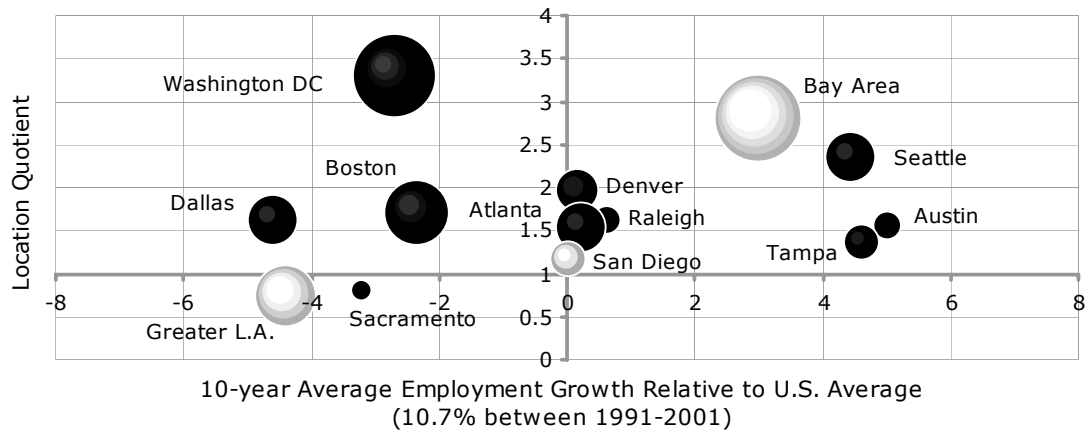
## F. Cluster Analysis Charts and Tables

### Information Technology

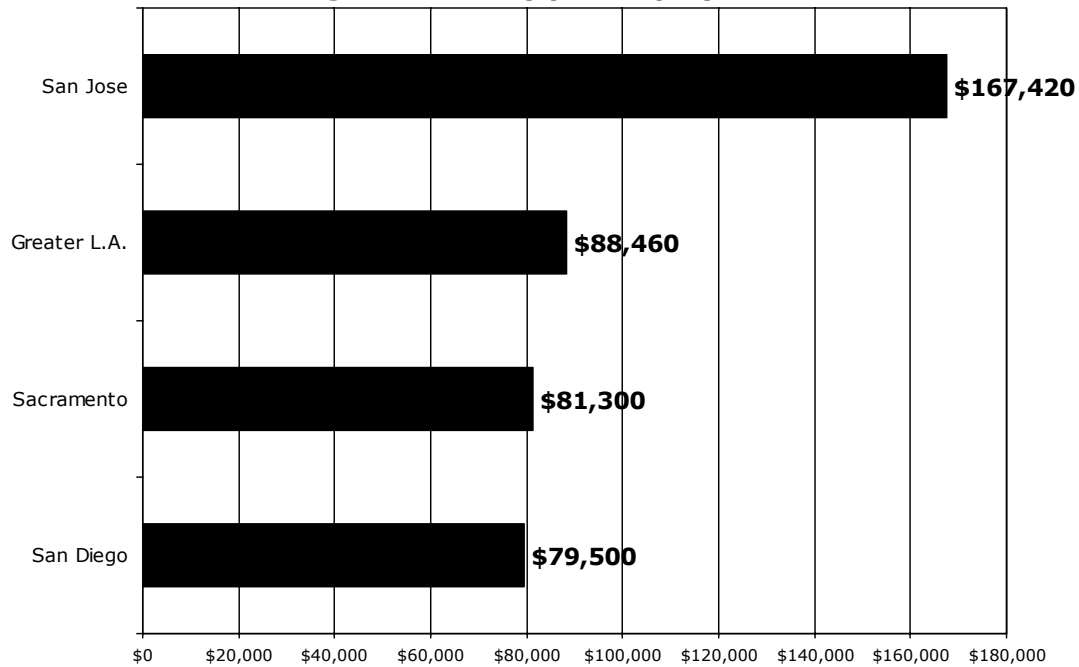
**Figure F-1.**  
**Top-Ranked Regions by Relative**  
**Concentration of IT Employment**

Rank	Region	Location Quotient
1	Washington DC	3.31
2	Bay Area	2.81
3	Seattle	2.83
4	Denver	1.98
5	Boston	1.73
6	Dallas	1.63
7	Raleigh-Durham	1.63
8	Austin	1.56
9	Atlanta	1.56
10	Tampa Bay	1.38
15	San Diego	1.18
26	Sacramento	0.77
28	Greater LA	0.75
	<b>California</b>	<b>1.27</b>

**Figure F-2.  
IT Cluster Growth Share Matrix**



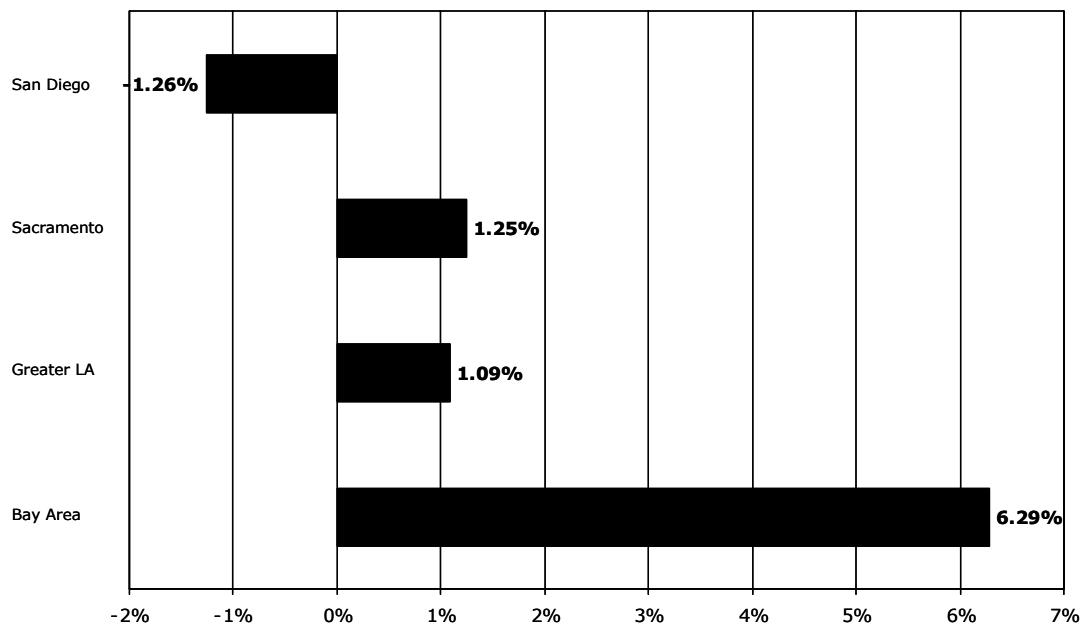
**Figure F-3.  
Average Annual Pay per Employee in IT**



Note: Average annual pay includes bonuses, the cash value of meals and lodging when supplied, tips and other gratuities, employer contributions to certain deferred compensation plans, such as 401(k) plans, and stock options.

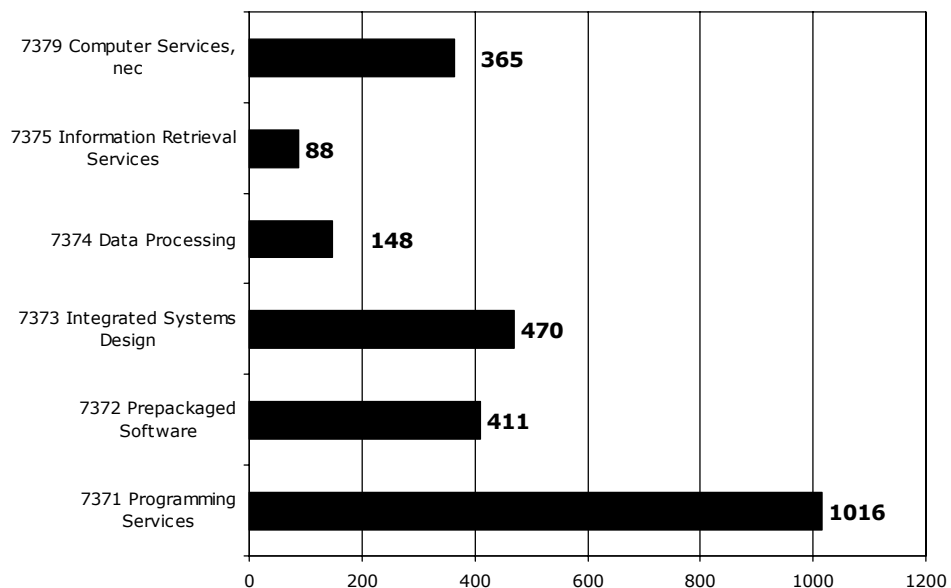


**Figure F-4.**  
**Annual Labor Productivity Growth in IT, 1991-2001**

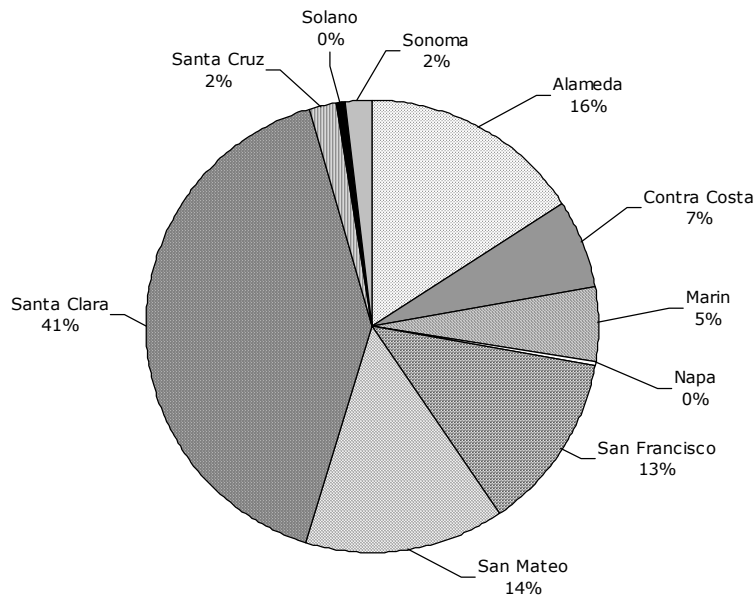


## ***Bay Area***

**Figure F-5.**  
**Number of IT Companies by SIC Codes**

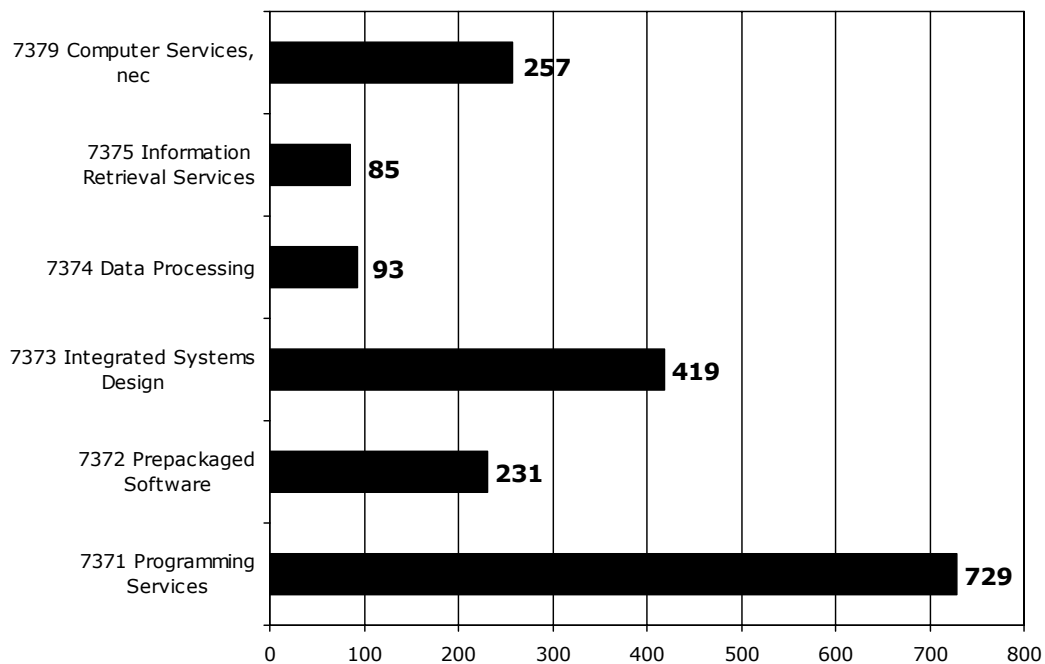


**Figure F-6.  
IT Companies by County**

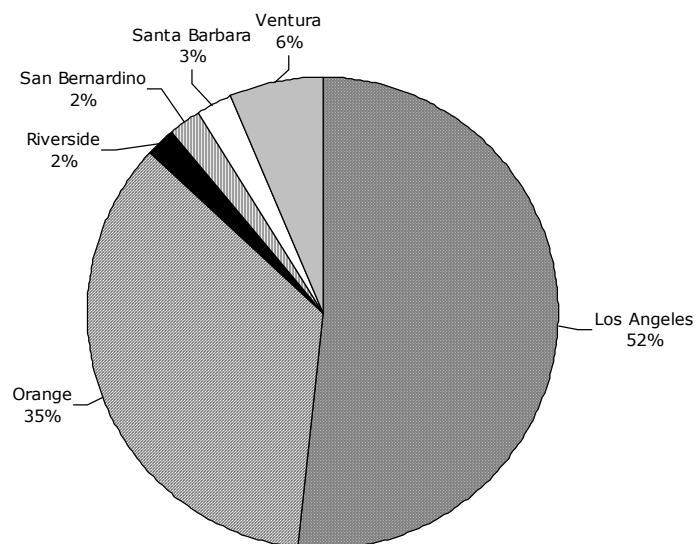


## Greater LA

**Figure F-7.  
Number of IT Companies by SIC Codes**

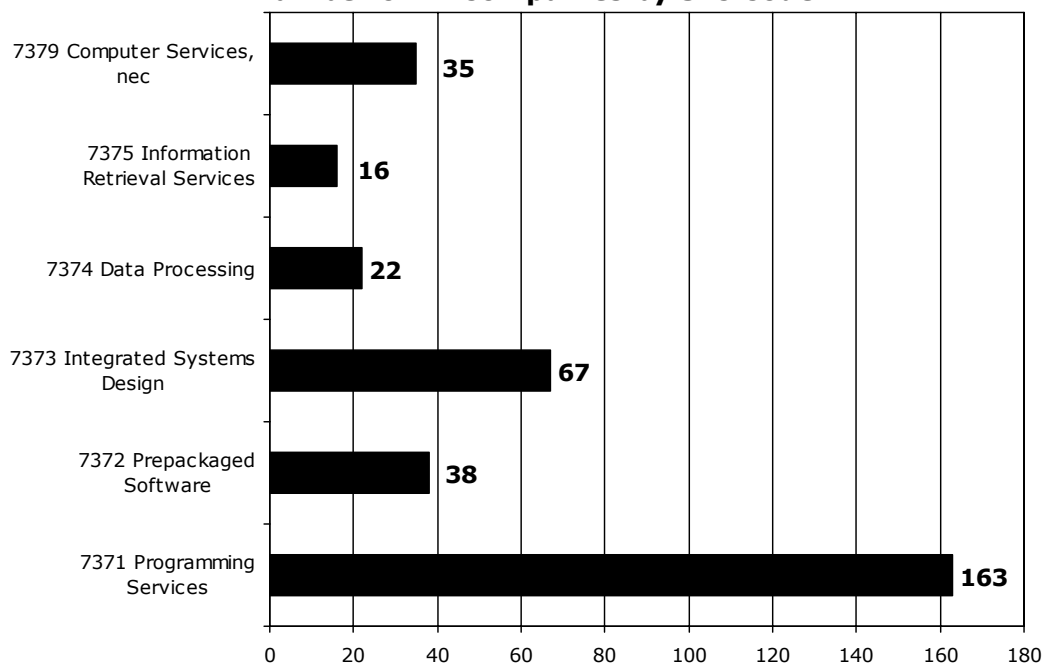


**Figure F-8.  
IT Companies by County**



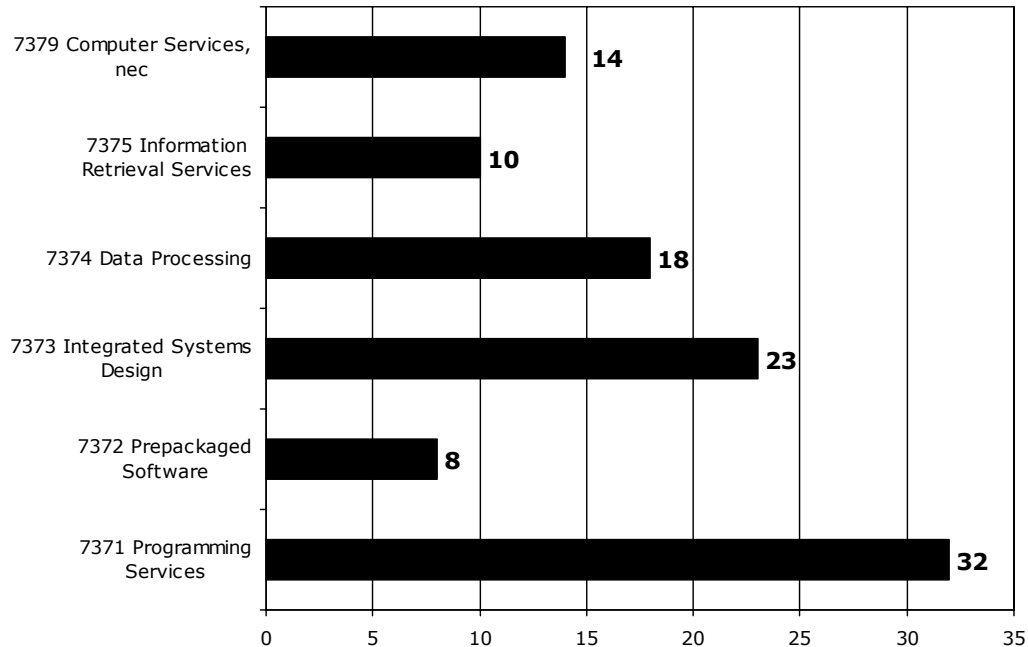
## San Diego

**Figure F-9.  
Number of IT Companies by SIC Code**



## Sacramento

**Figure F-10.**  
**Number of IT Companies by SIC Code**

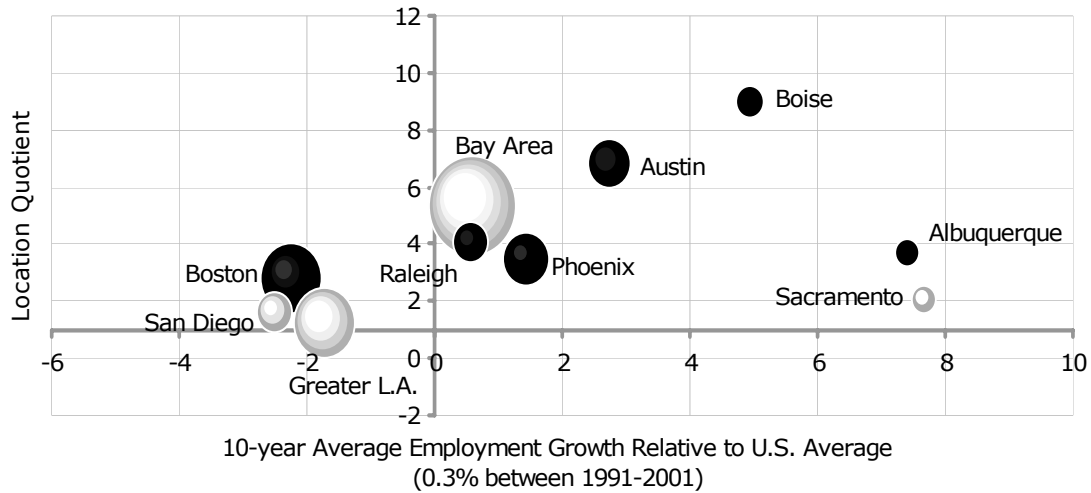


## Computers and Semiconductors

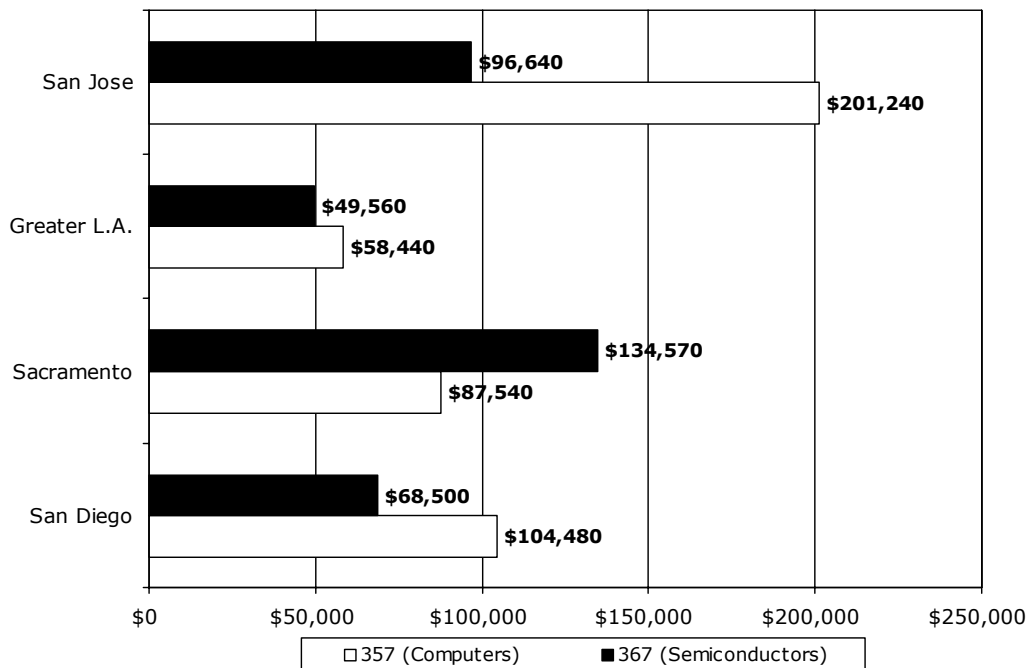
**Figure F-11.**  
**Top-Ranked Regions in Computers and Semiconductors**  
**by Relative Concentration of Employment**

Rank	Region	Location Quotient
1	Boise	9.06
2	Austin	6.86
3	Bay Area	5.38
4	Raleigh-Durham	4.08
5	Albuquerque	3.72
6	Phoenix	3.55
7	Boston	2.82
8	Sacramento	2.12
9	Dallas	1.61
10	San Diego	1.46
12	Greater LA	1.28
	<b>California</b>	<b>2.28</b>

**Figure F-12.**  
**Computers and Semiconductors Cluster Growth Share Matrix**

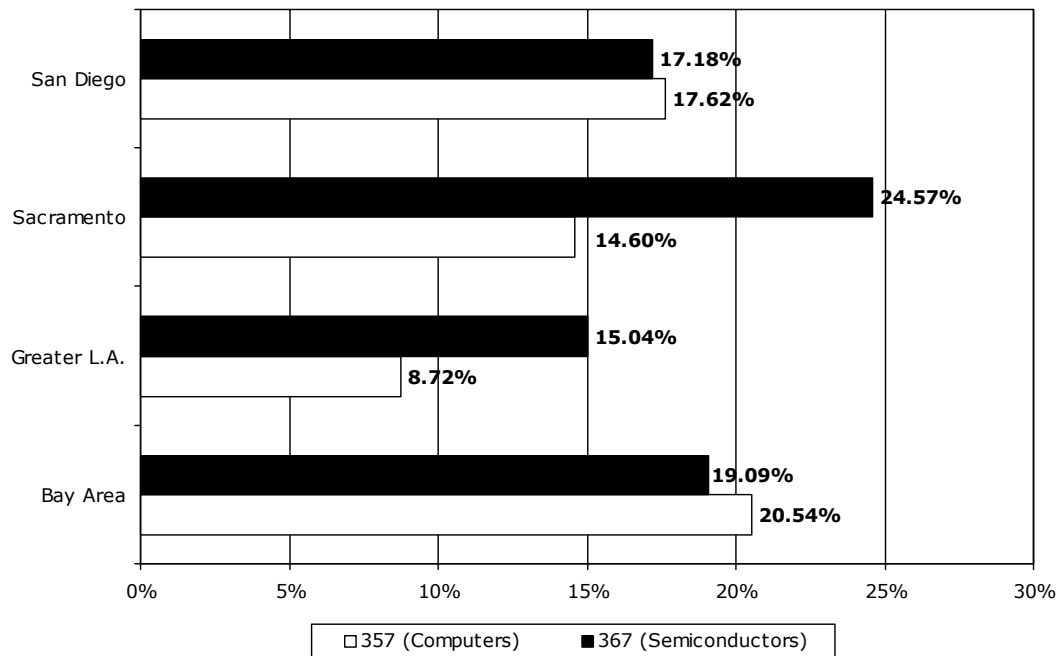


**Figure F-13.**  
**Average Annual Pay per Employee  
in Computers and Semiconductor Industry**



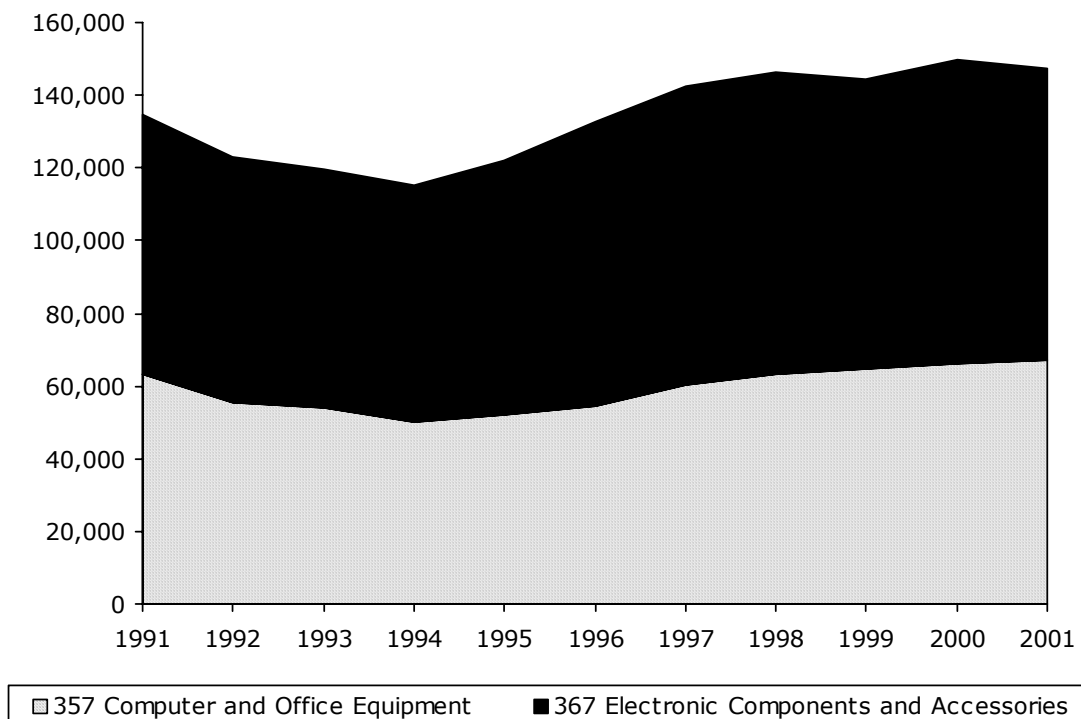
Note: Average annual pay includes bonuses, the cash value of meals and lodging when supplied, tips and other gratuities, employer contributions to certain deferred compensation plans, such as 401(k) plans, and stock options.

**Figure F-14.**  
**Annual Growth in Labor Productivity 1991-2001**

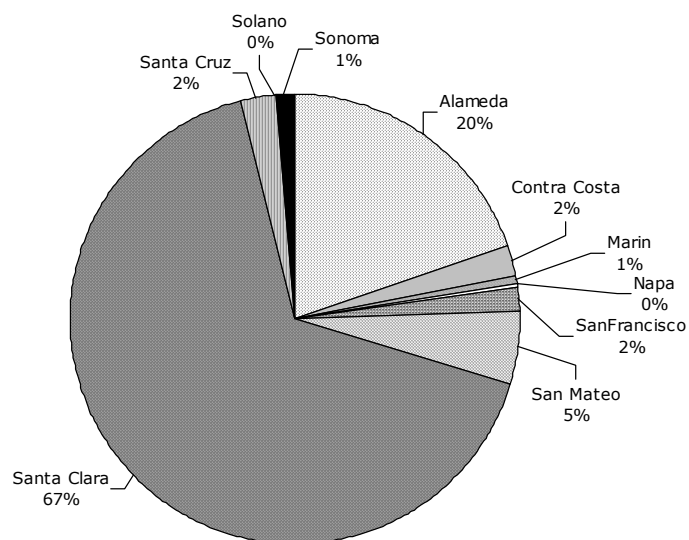


## Bay Area

**Figure F-15.**  
**Employment Change in Computers and Semiconductors**

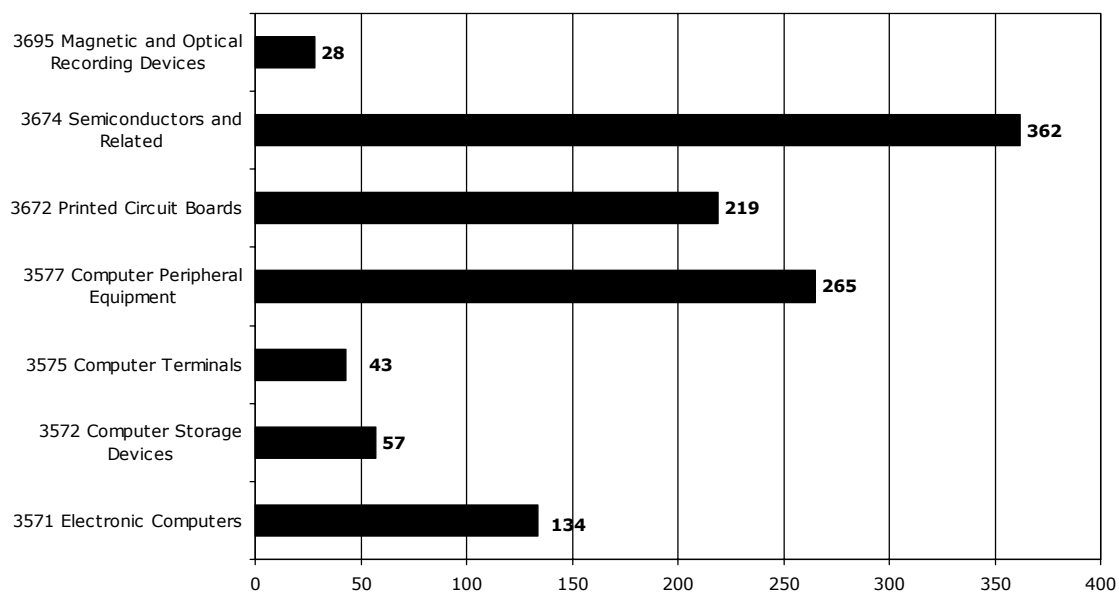


**Figure F-16.**  
**Computers and Semiconductors Companies by County**

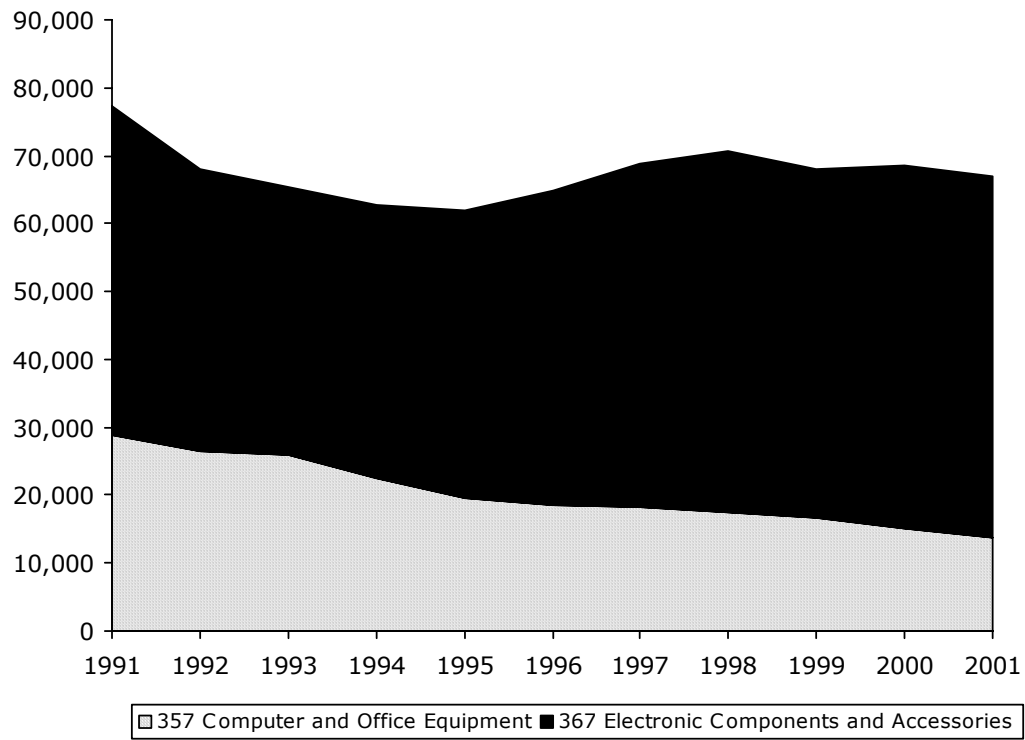


## Greater LA

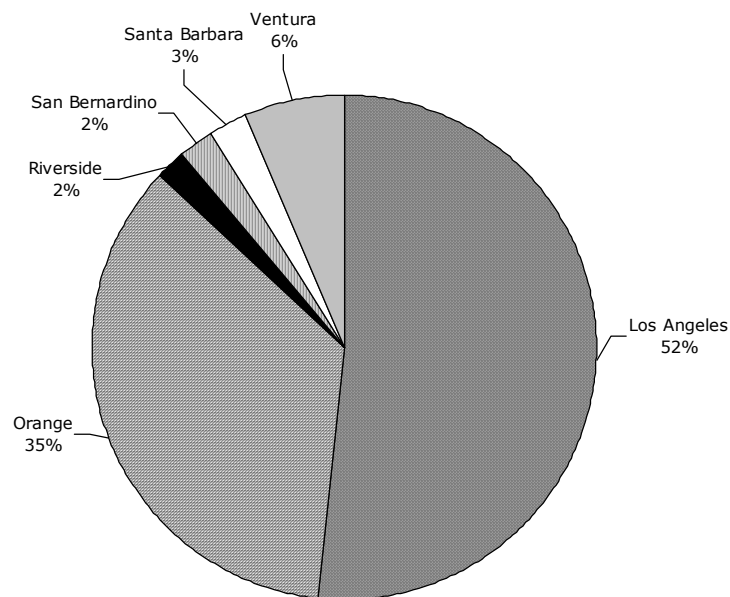
**Figure F-17.**  
**Number of Computer-Related Establishments by SIC Code**



**Figure F-18.**  
**Employment Change in Semiconductors and Computers, 1991-2001**

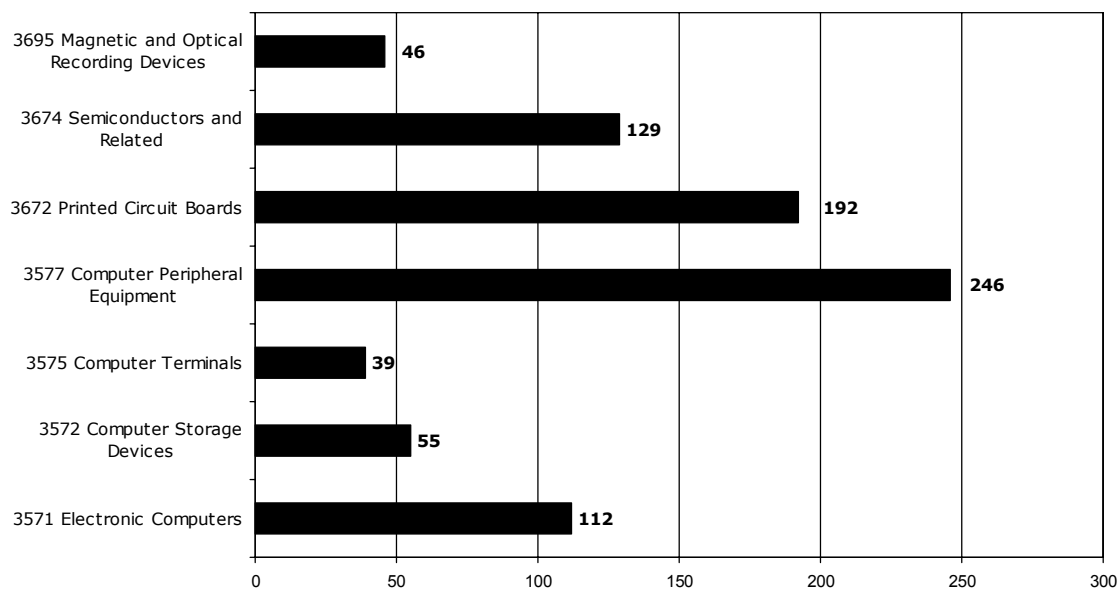


**Figure F-19.**  
**Computers and Semiconductors Companies by County**



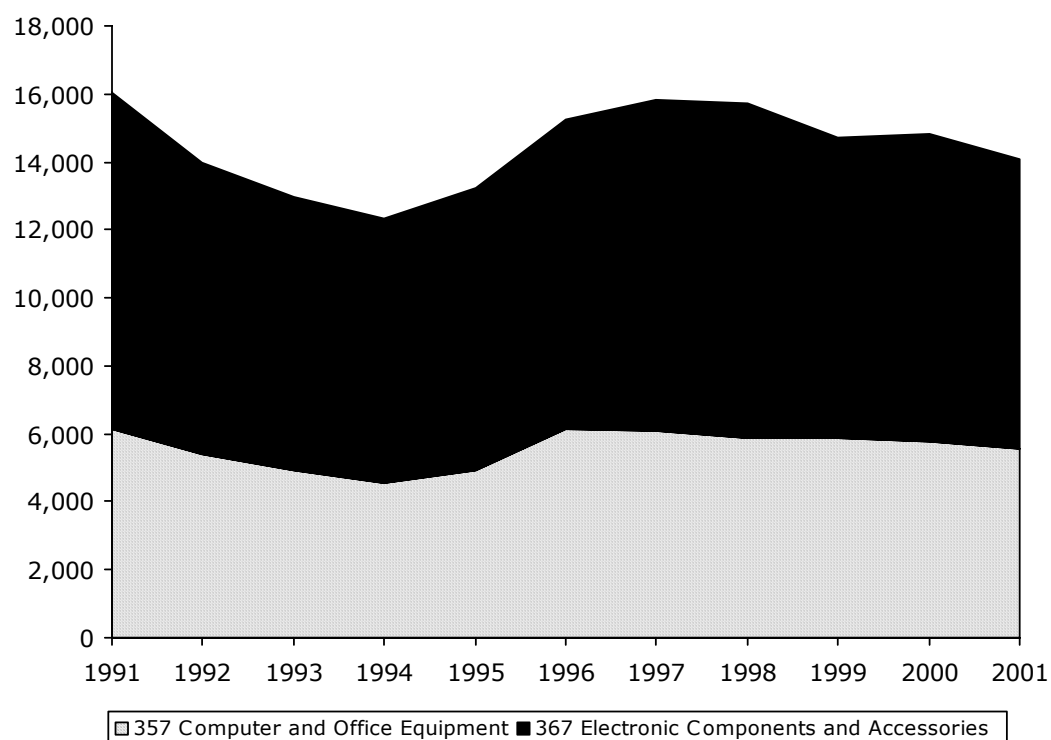


**Figure F-20.**  
**Number of Computers and Semiconductors Companies by SIC Code**

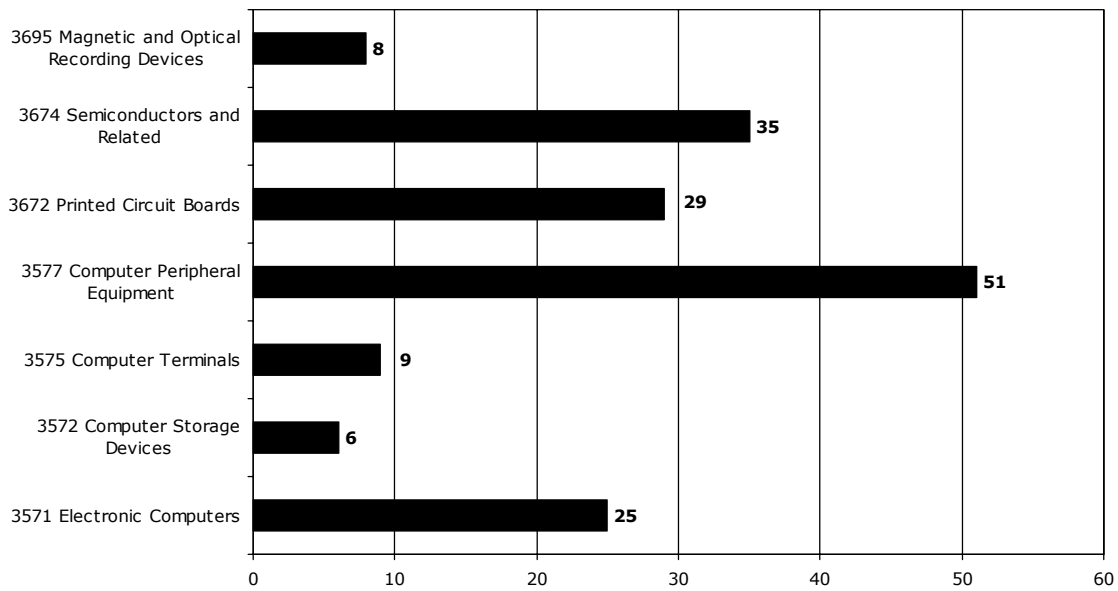


## San Diego

**Figure F-21.**  
**Computers and Semiconductors Employment Levels by SIC Code**

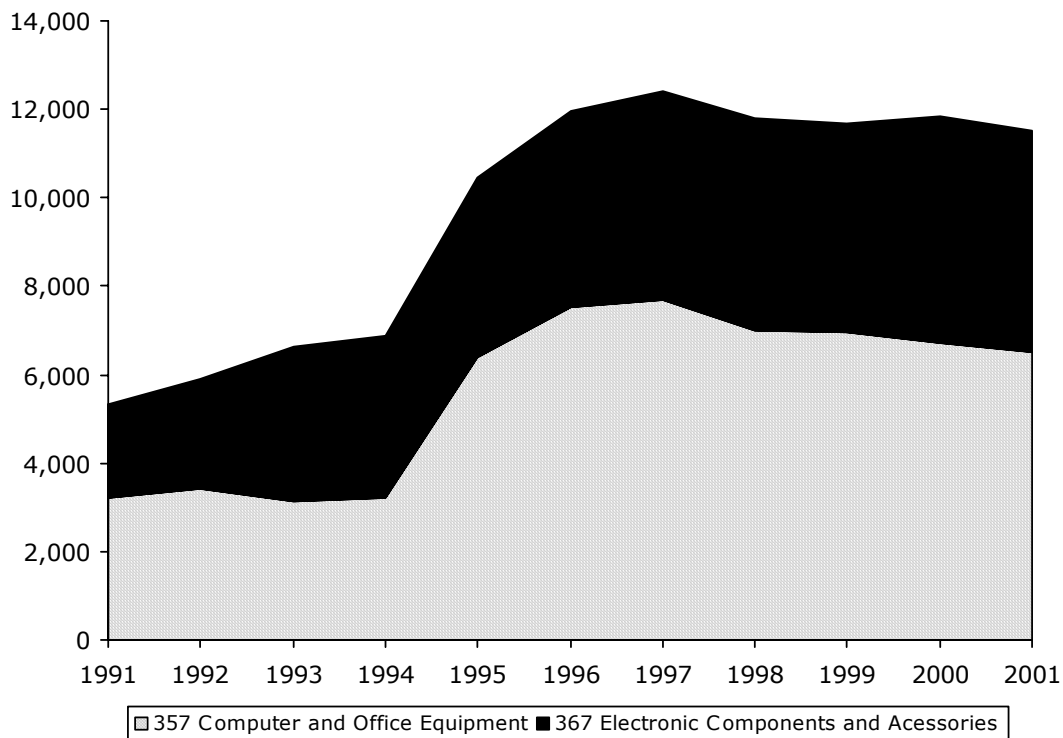


**Figure F-22.**  
**Number of Computers and Semiconductors Companies by SIC Code**

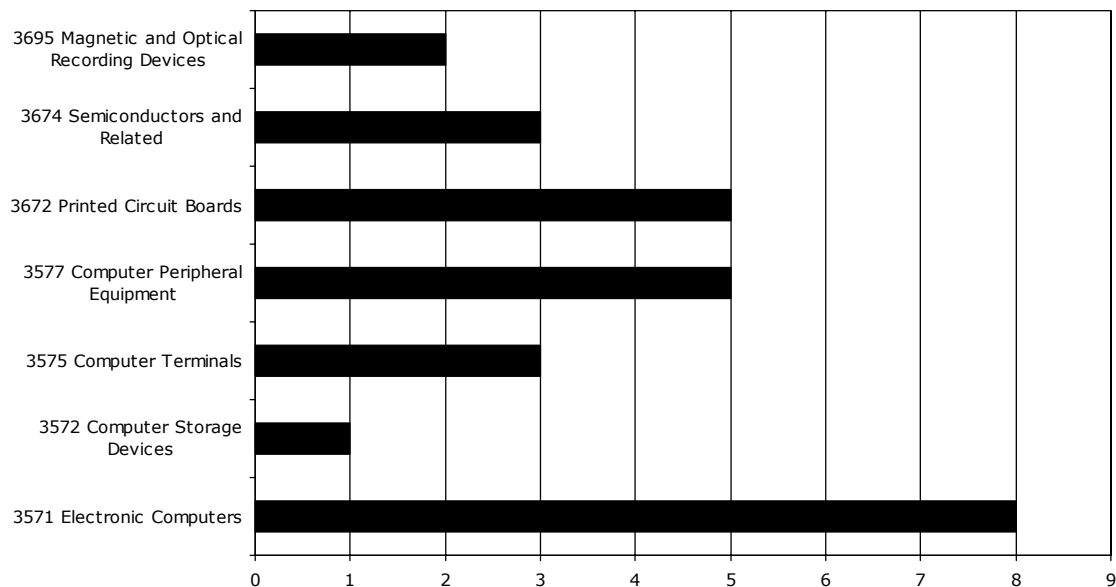


## Sacramento

**Figure F-23.**  
**Computers and Semiconductors Employment by SIC Code**



**Figure F-24.**  
**Number of Computers and Semiconductors Companies by SIC Code**

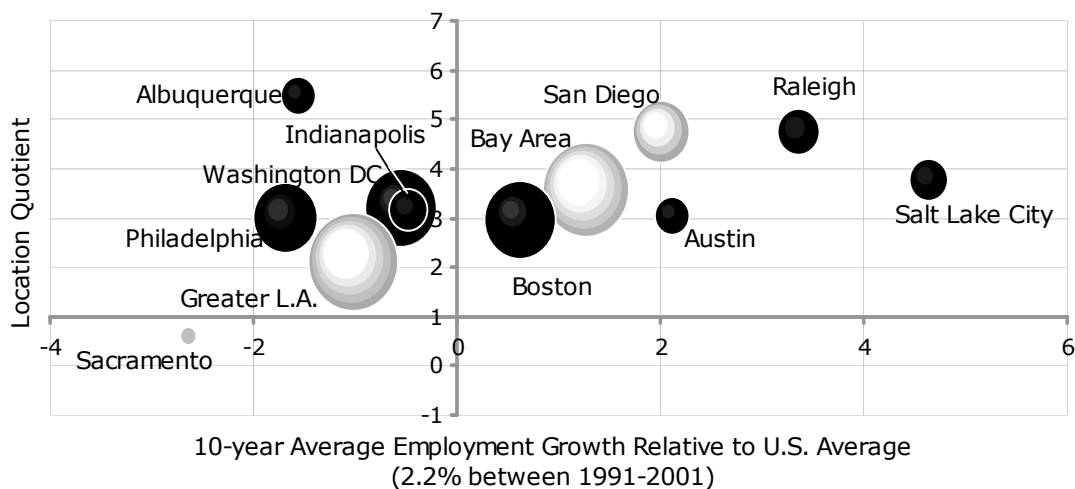


## Biosciences

**Figure F-25.**  
**Top-Ranked Regions in Biosciences by Relative Concentration of Employment**

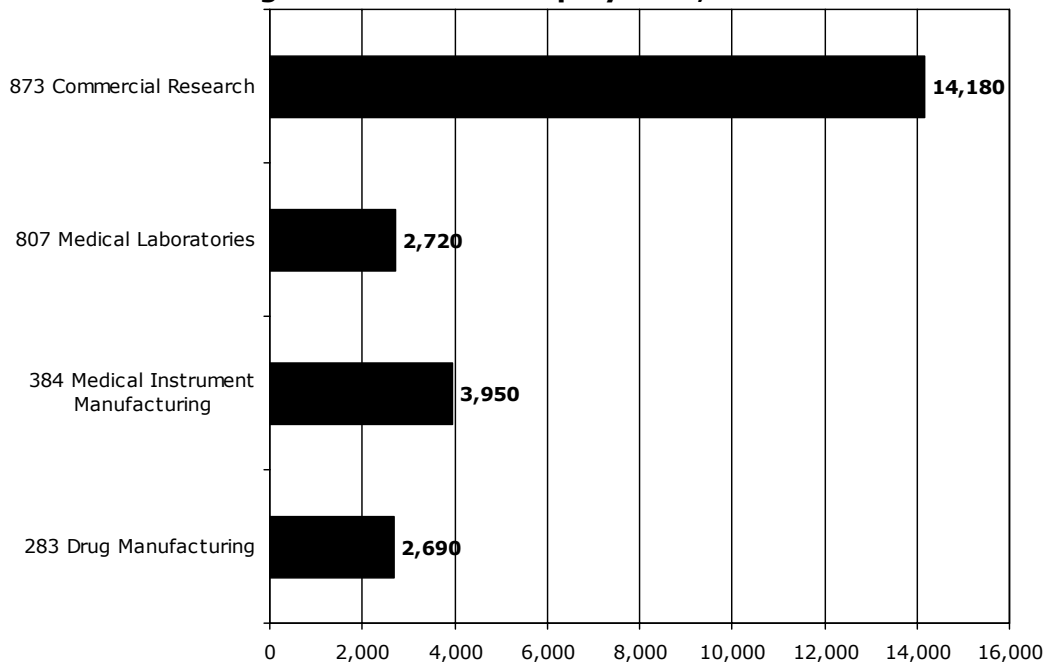
Rank	Region	Location Quotient
1	Albuquerque	5.51
2	Raleigh-Durham	4.76
3	San Diego	4.75
4	Salt Lake City	3.79
5	Bay Area	3.57
6	Washington DC	3.22
7	Indianapolis	3.19
8	Austin	3.06
9	Philadelphia	3.01
10	Boston	2.97
14	Greater LA	2.11
45	Sacramento	0.63
	<b>California</b>	<b>2.47</b>

**Figure F-26.**  
**Biosciences Cluster Growth Share Matrix**

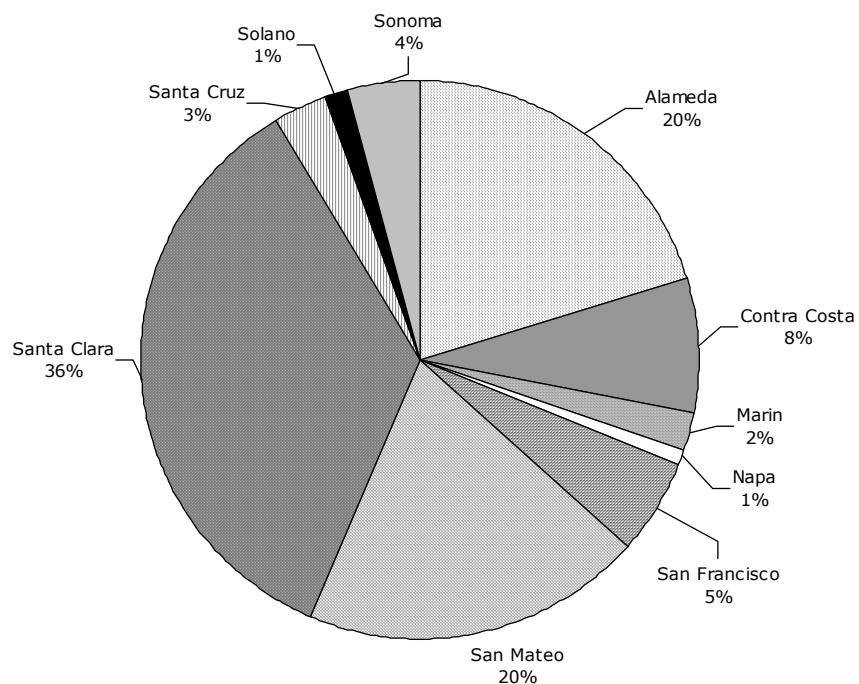


## **Bay Area**

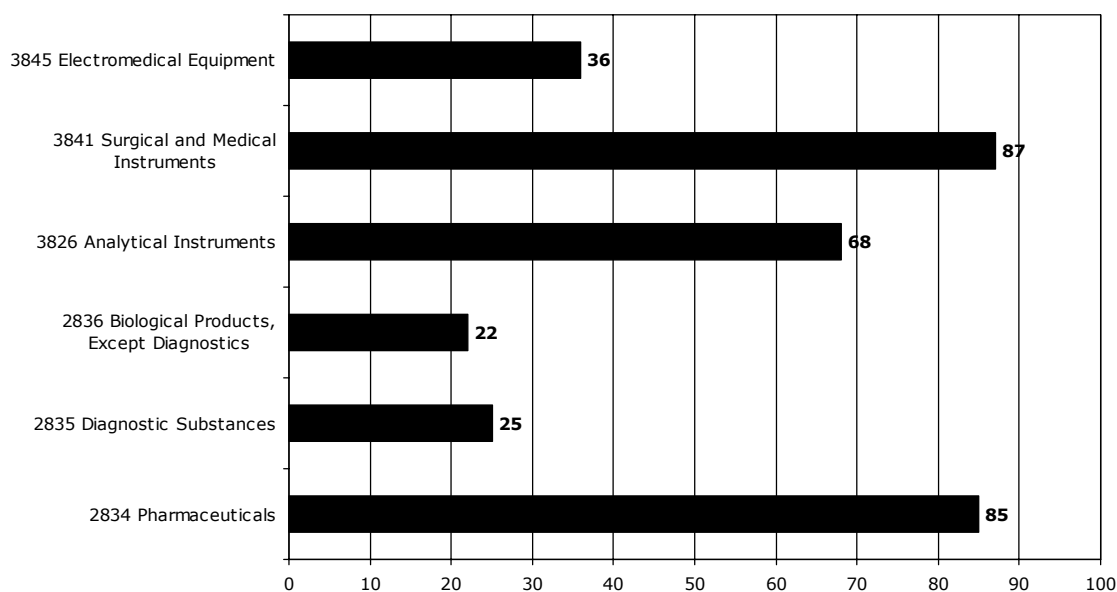
**Figure F-27.**  
**Change in Bioscience Employment, 1991-2001**



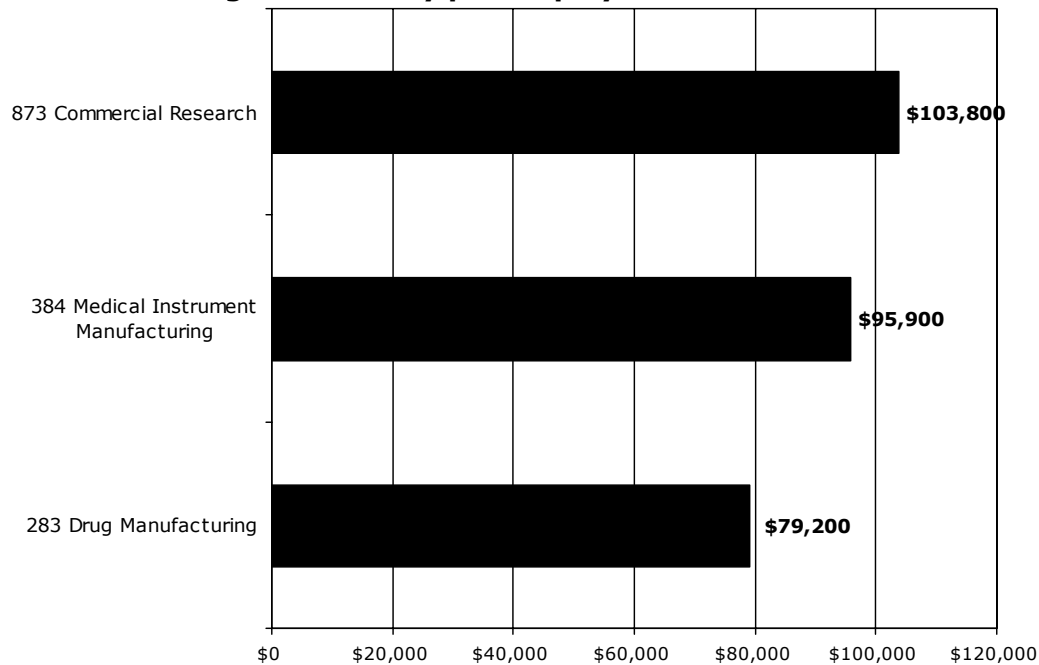
**Figure F-28.**  
**Bioscience Business Companies by County**



**Figure F-29.**  
**Number of Biosciences Companies by SIC Code**

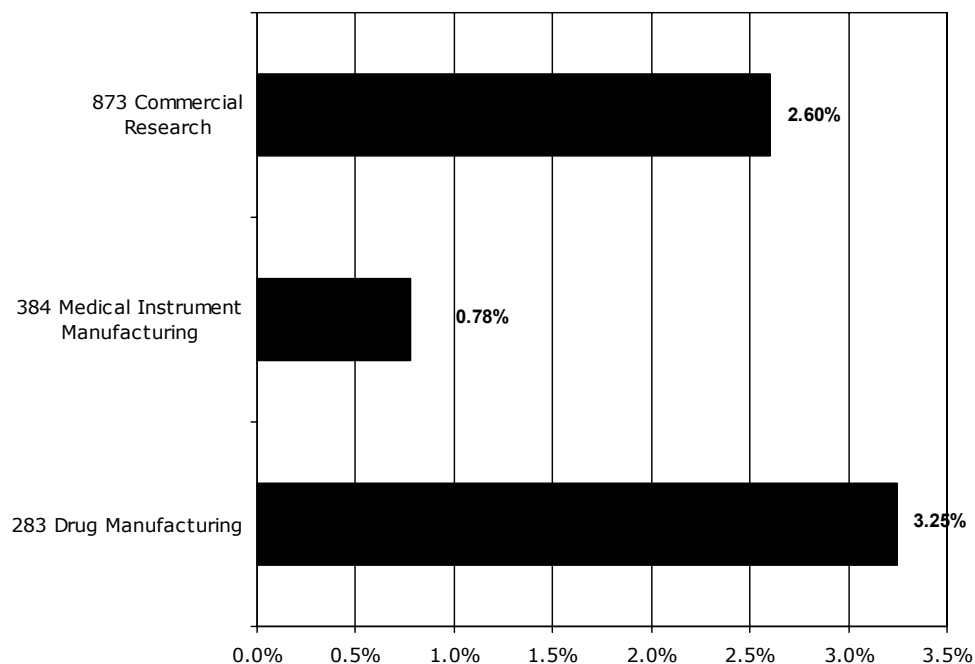


**Figure F-30.**  
**Average Annual Pay per Employee in the Biosciences**



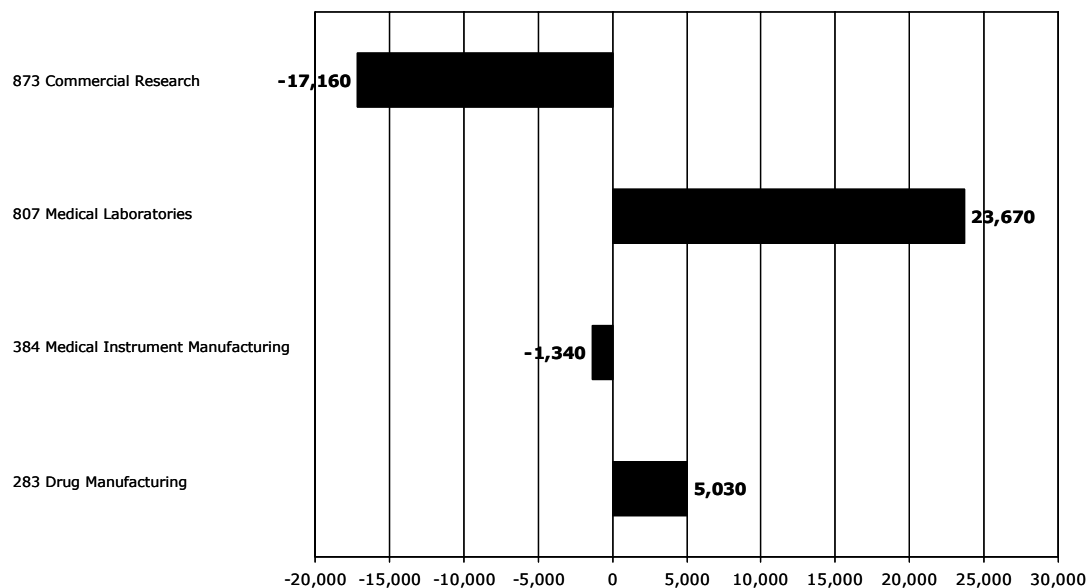
Note: Average annual pay includes bonuses, the cash value of meals and lodging when supplied, tips and other gratuities, employer contributions to certain deferred compensation plans, such as 401(k) plans, and stock options.

**Figure F-31.**  
**Annual Labor Productivity Growth in Output per Worker, 1991–2001**

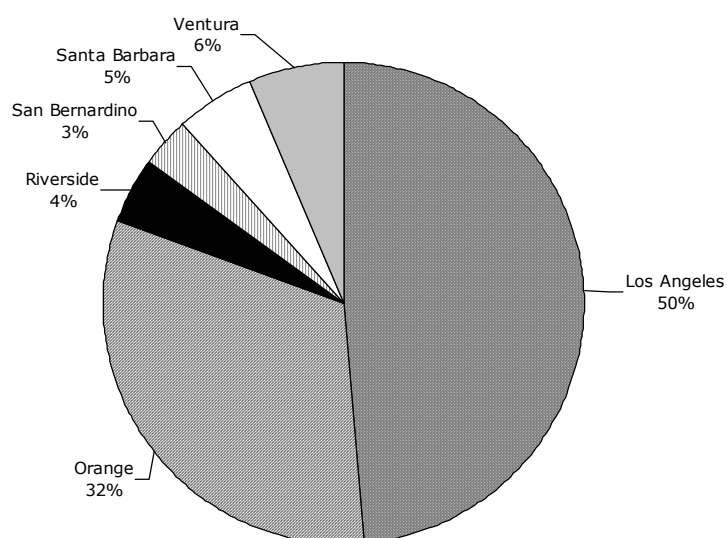


**Greater LA**

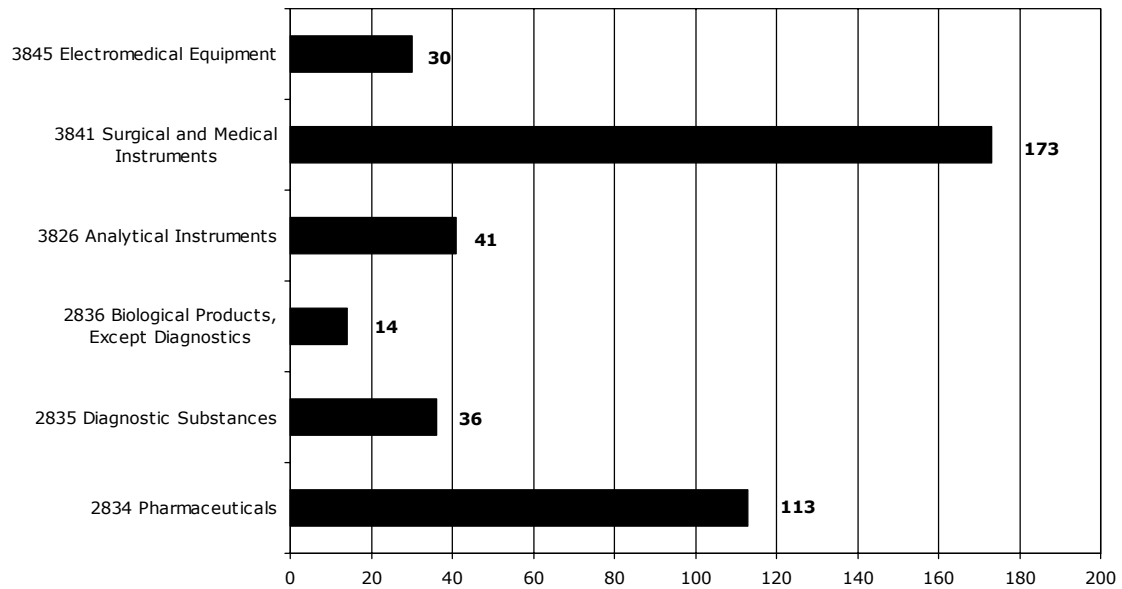
**Figure F-32.**  
**Change in Employment in Biosciences, 1991-2001**



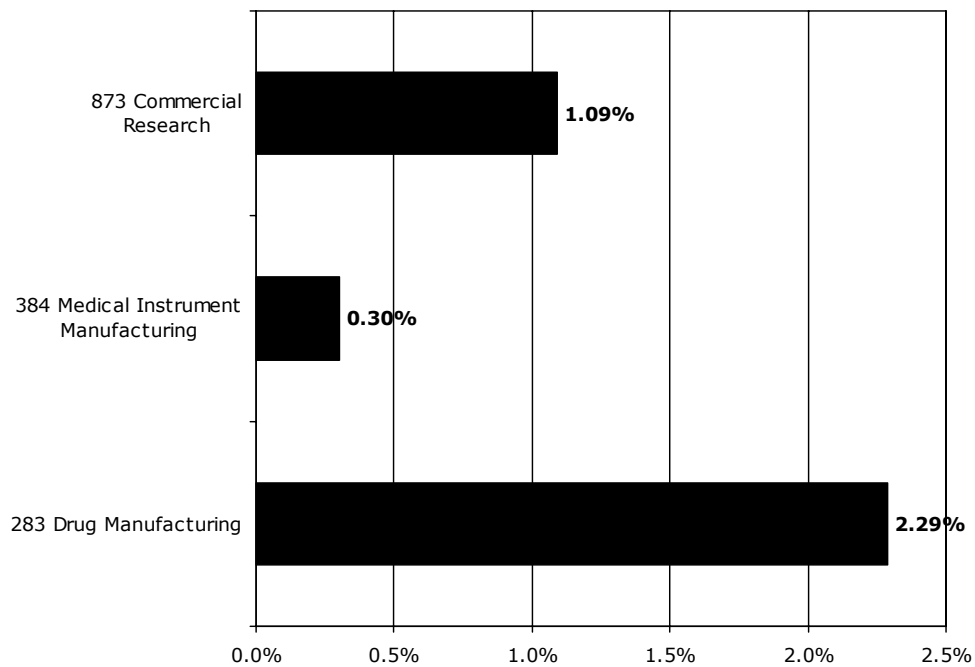
**Figure F-33.**  
**Biosciences Companies by County**



**Figure F-34.**  
**Number of Biosciences Companies by SIC Code**

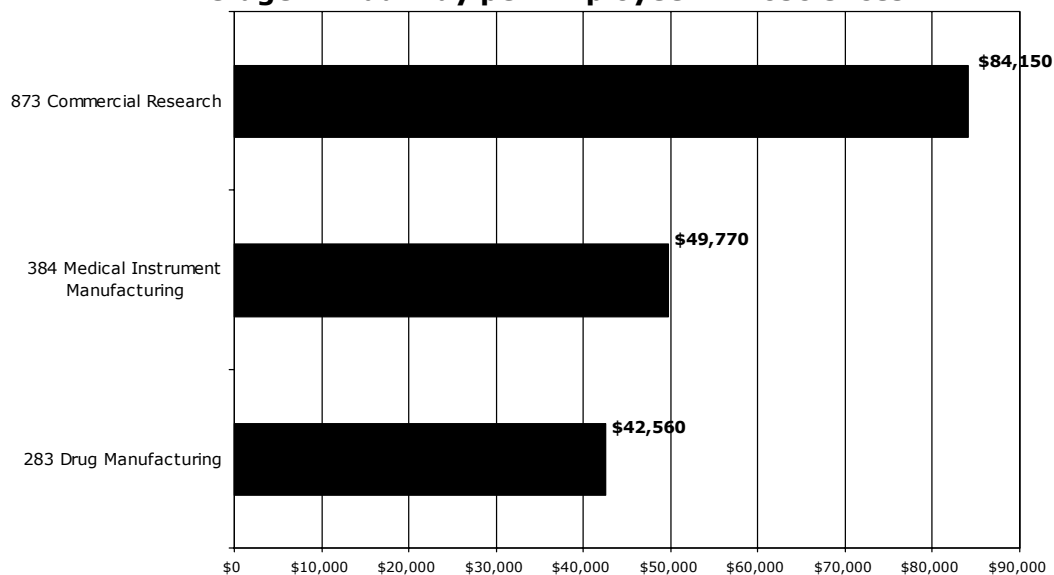


**Figure F-35.**  
**Annual Growth in Labor Productivity per Worker, 1991-2001**





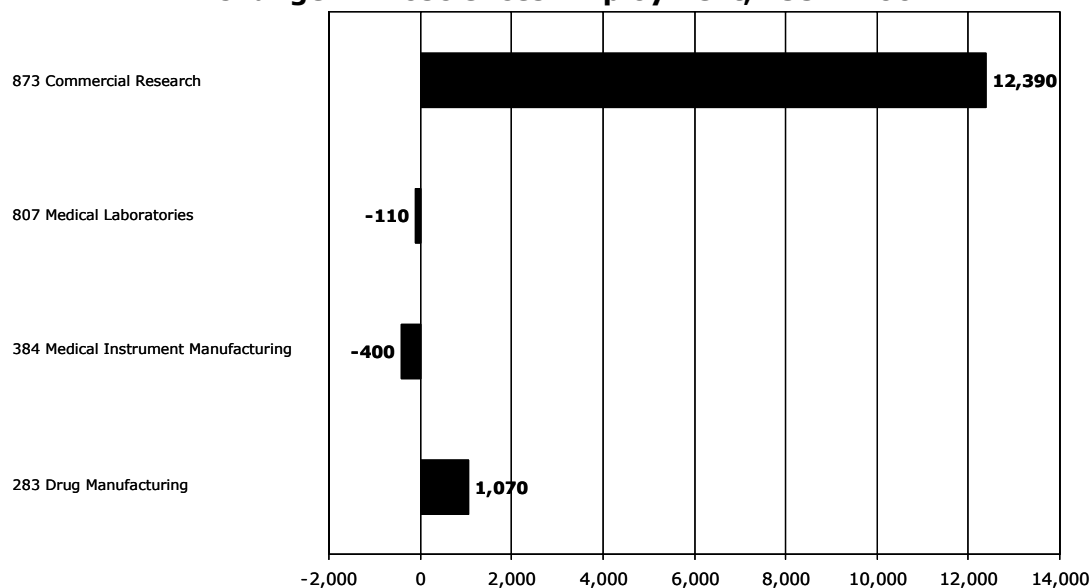
**Figure F-36.**  
**Average Annual Pay per Employee in Biosciences**



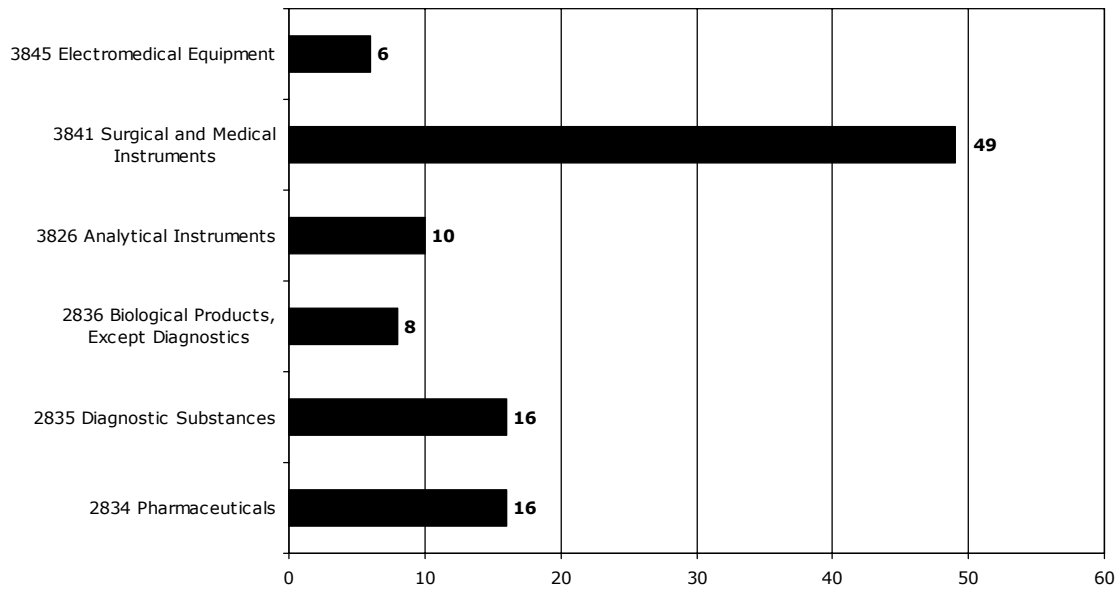
Note: Average annual pay includes bonuses, the cash value of meals and lodging when supplied, tips and other gratuities, employer contributions to certain deferred compensation plans, such as 401(k) plans, and stock options.

## San Diego

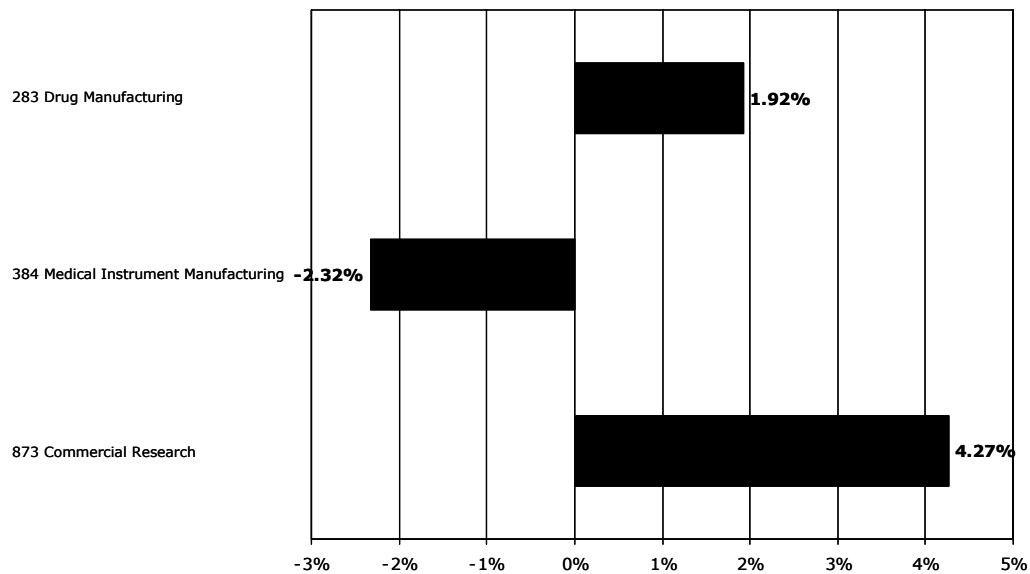
**Figure F-37.**  
**Change in Biosciences Employment, 1991–2001**



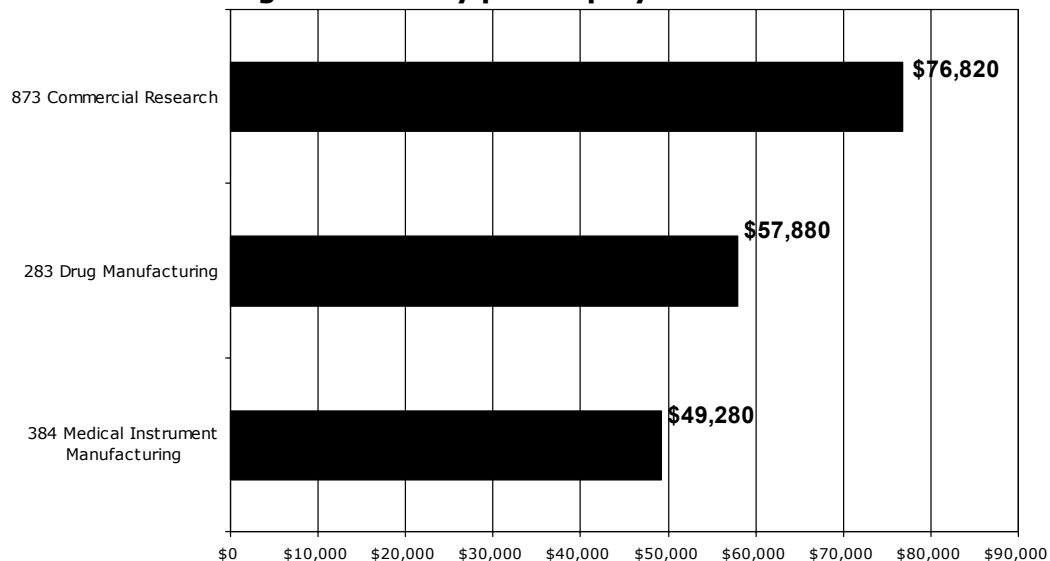
**Figure F-38.  
Number of Biosciences Companies**



**Figure F-39.  
Annual Growth in Labor Productivity per Worker, 1991–2001**



**Figure F-40.**  
**Average Annual Pay per Employee in Biosciences**



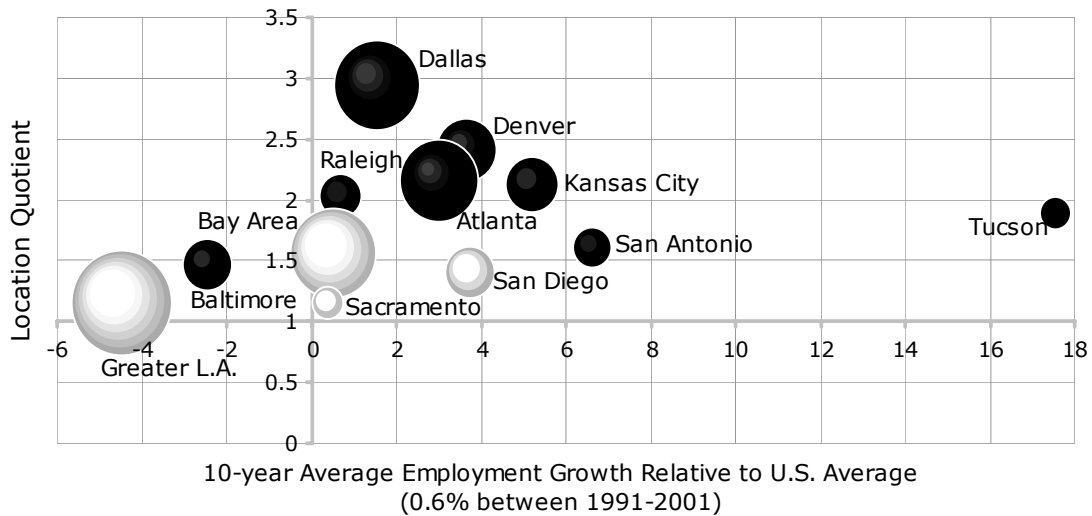
Note: Average annual pay includes bonuses, the cash value of meals and lodging when supplied, tips and other gratuities, employer contributions to certain deferred compensation plans, such as 401(k) plans, and stock options.

## Telecommunications

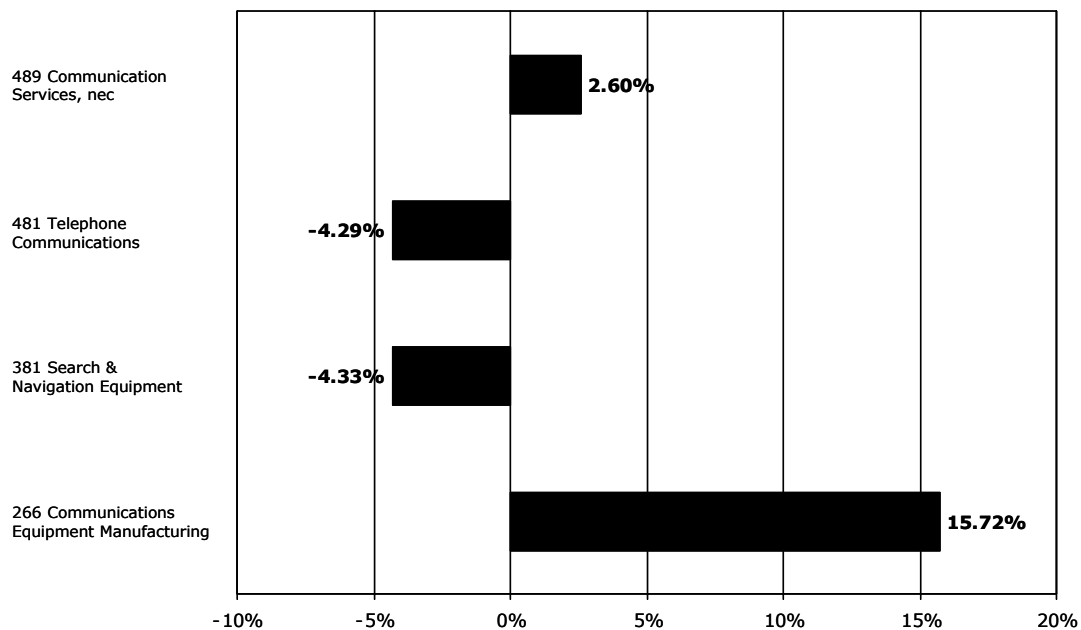
**Figure F-41.**  
**Top Ranked Regions in Telecommunications**  
**by Relative Concentration of Employment**

Rank	Region	Location Quotient
1	Dallas	2.95
2	Denver	2.42
3	Atlanta	2.17
4	Kansas City	2.14
5	Raleigh-Durham	2.03
6	Tucson	1.90
7	San Antonio	1.62
8	Bay Area	1.58
9	Baltimore	1.47
10	San Diego	1.42
12	Sacramento	1.17
13	Greater LA	1.16
	<b>California</b>	<b>1.20</b>

**Figure F-42.**  
**Telecommunications Cluster Growth Share Matrix**

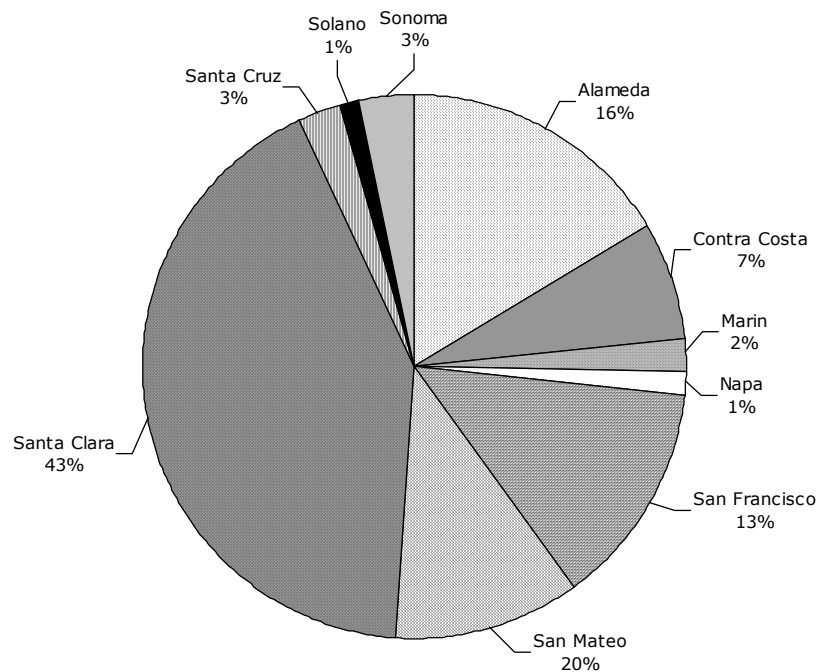


**Figure F-43.**  
**Change in Telecommunications Employment by SIC Code**

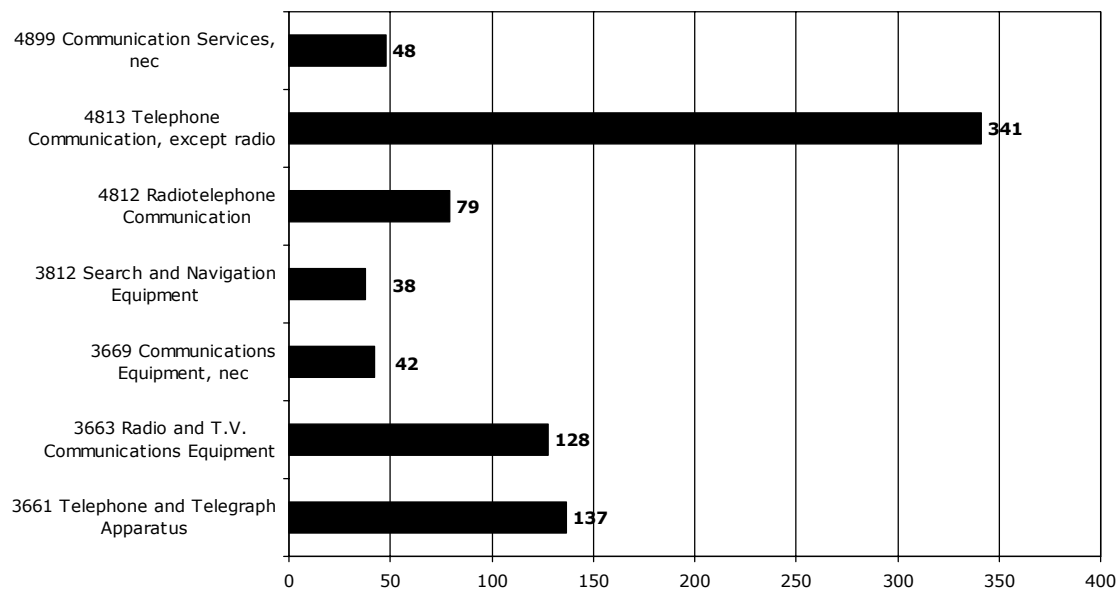


## Bay Area

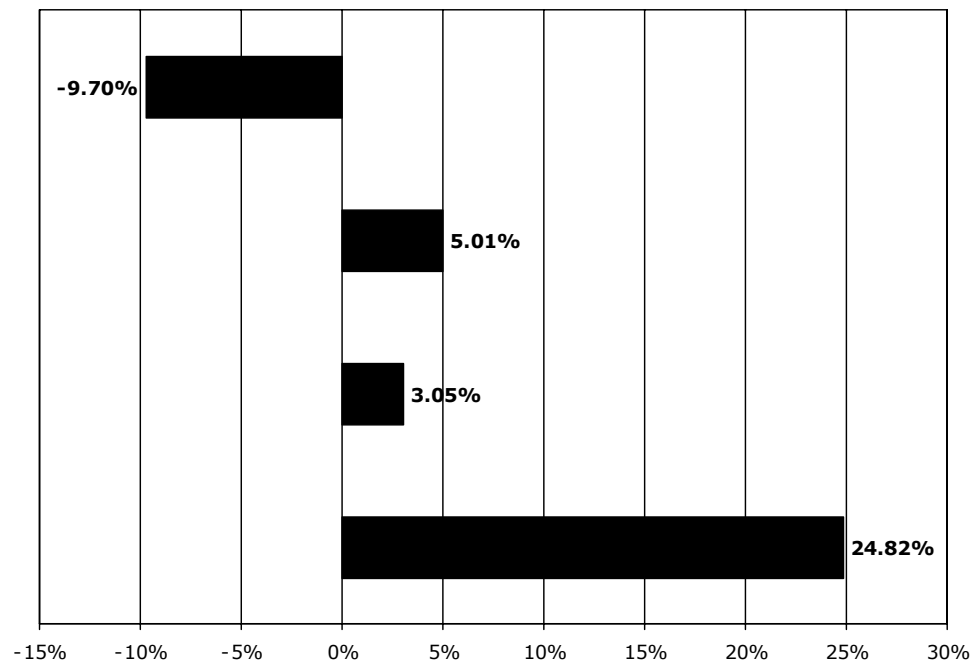
**Figure F-44.**  
**Telecom Business Companies by County**



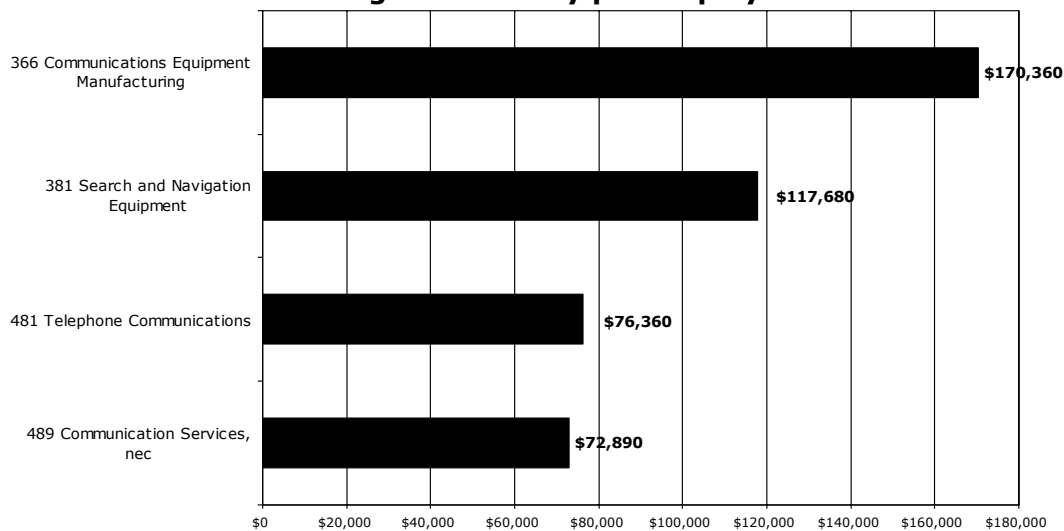
**Figure F-45.**  
**Number of Telecom Companies by SIC Code**



**Figure F-46.**  
**Annual Growth in Labor Productivity per Worker, 1991–2001**



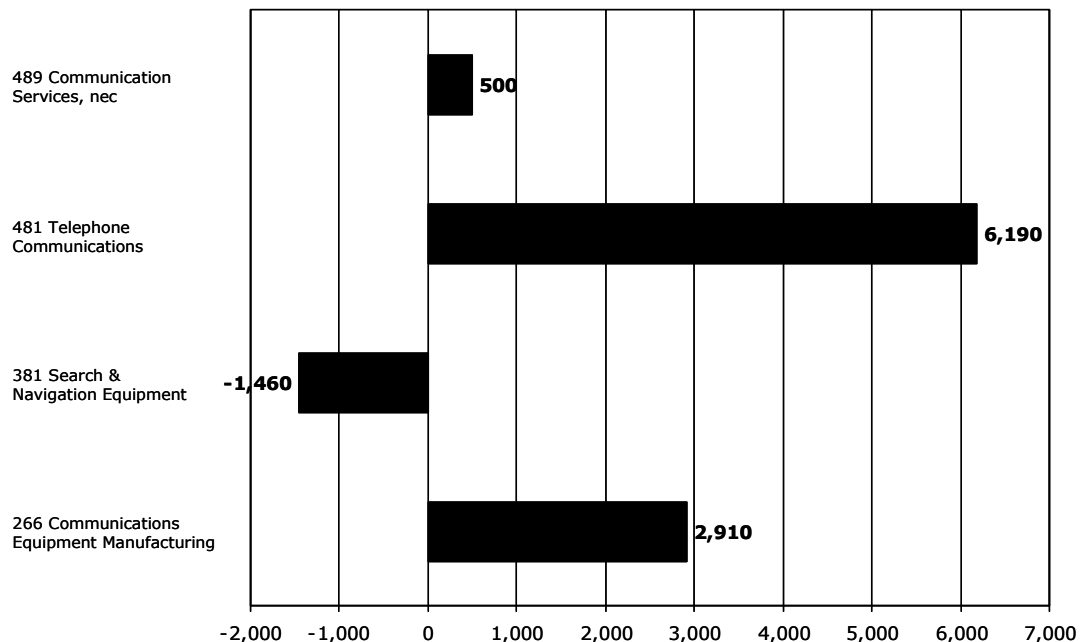
**Figure F-47.**  
**Average Annual Pay per Employee**



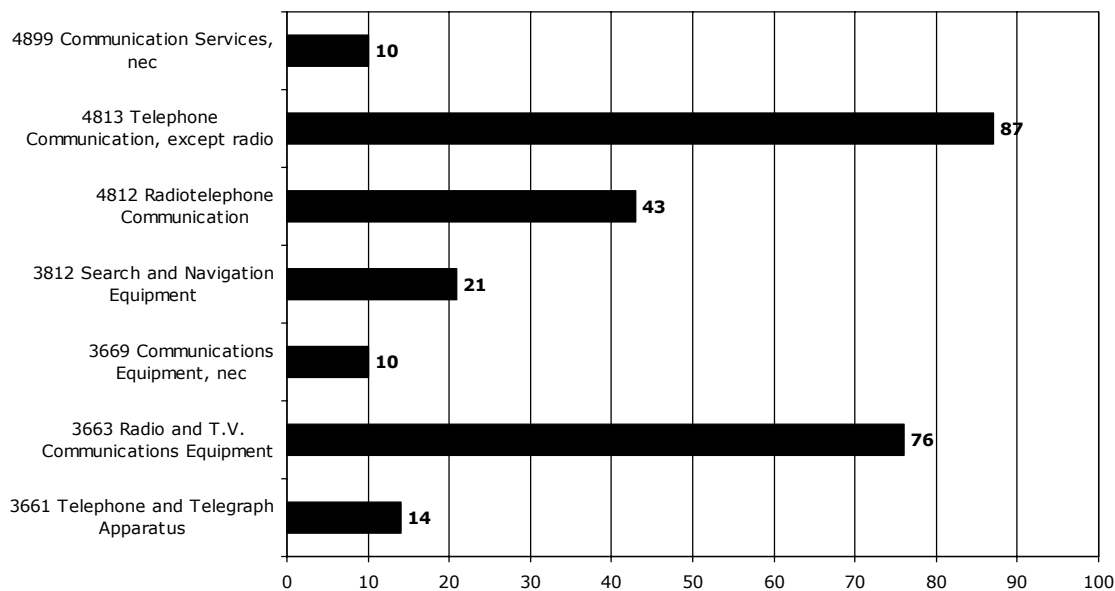
Note: Average annual pay includes bonuses, the cash value of meals and lodging when supplied, tips and other gratuities, employer contributions to certain deferred compensation plans, such as 401(k) plans, and stock options.

## San Diego

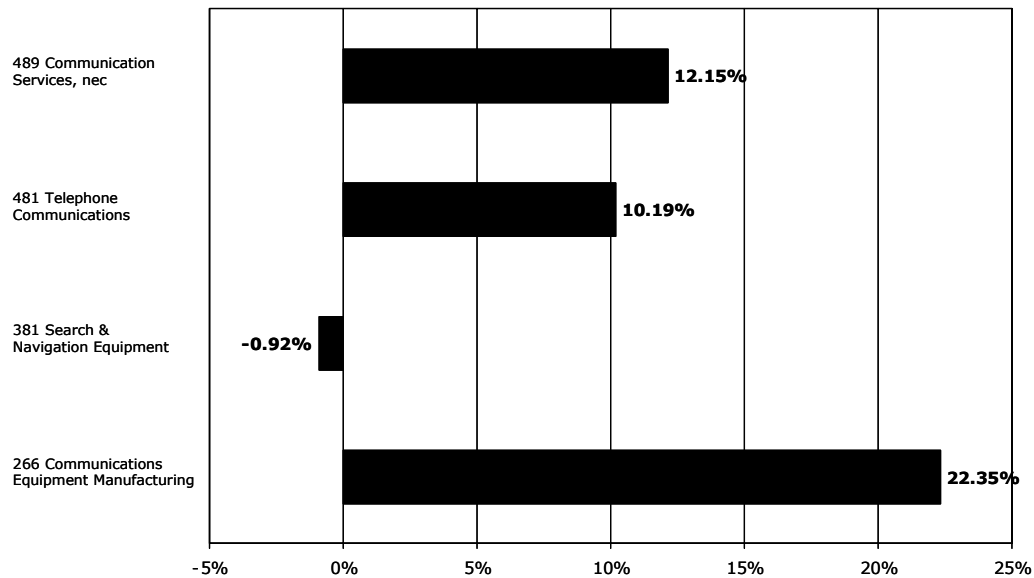
**Figure F-48.**  
**Change in Telecom Employment, 1991–2001**



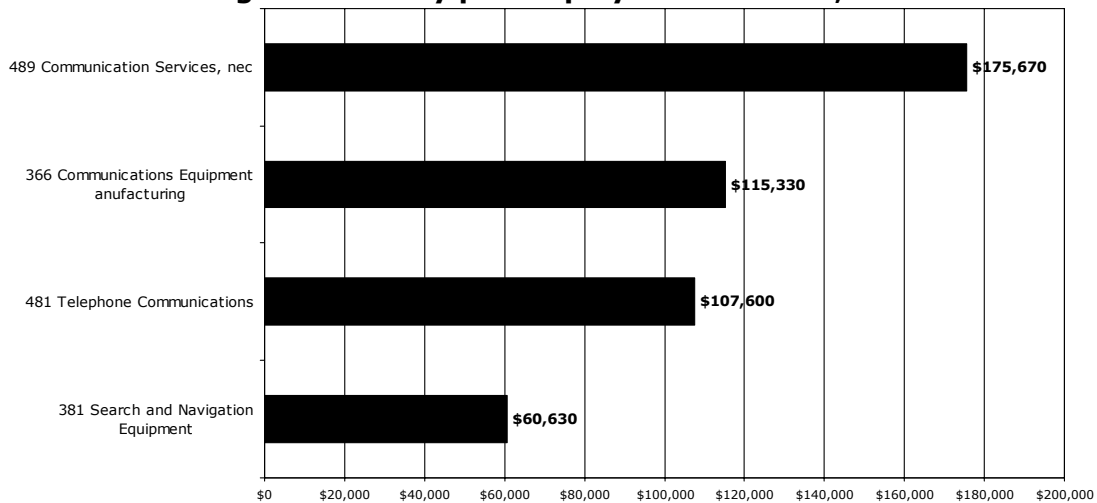
**Figure F-49.**  
**Number of Telecom Companies by SIC Code**



**Figure F-50.**  
**Annual Growth in Labor Productivity per Worker, 1991–2001**



**Figure F-51.**  
**Average Annual Pay per Employee in Telecom, 2001**



Note: Average annual pay includes bonuses, the cash value of meals and lodging when supplied, tips and other gratuities, employer contributions to certain deferred compensation plans, such as 401(k) plans, and stock options.

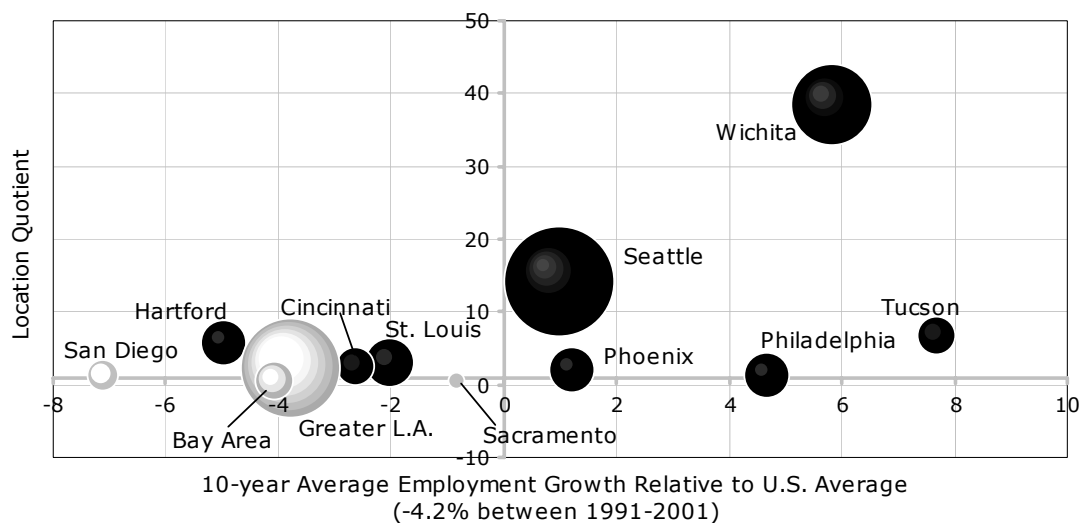


## Aerospace

**Figure F-52.**  
**Top Ranked Regions in Aerospace by**  
**Relative Concentration of Employment**

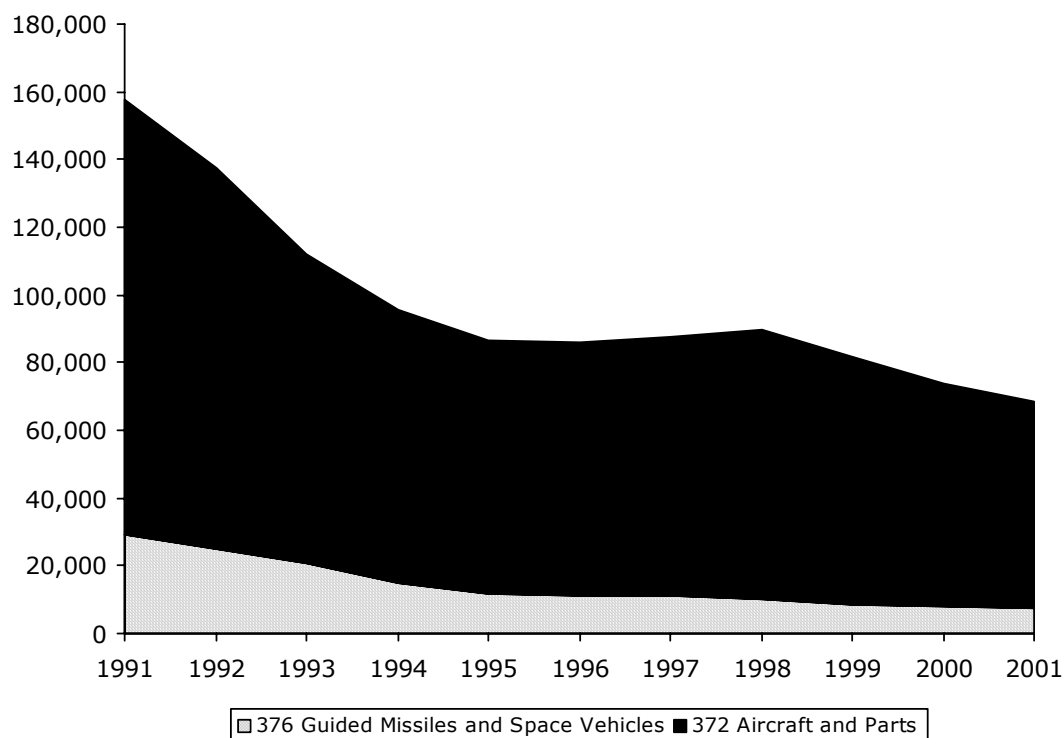
Rank	Region	Location Quotient
1	Wichita	38.61
2	Seattle	14.18
3	Tucson	6.91
4	Hartford	5.96
5	St. Louis	3.16
6	Cincinnati	2.57
7	Greater LA	2.39
8	Phoenix	2.16
9	San Diego	1.39
10	Philadelphia	1.39
19	Sacramento	0.67
20	Bay Area	0.66
	<b>California</b>	<b>1.52</b>

**Figure F-53.**  
**Aerospace Cluster Growth Share Matrix**

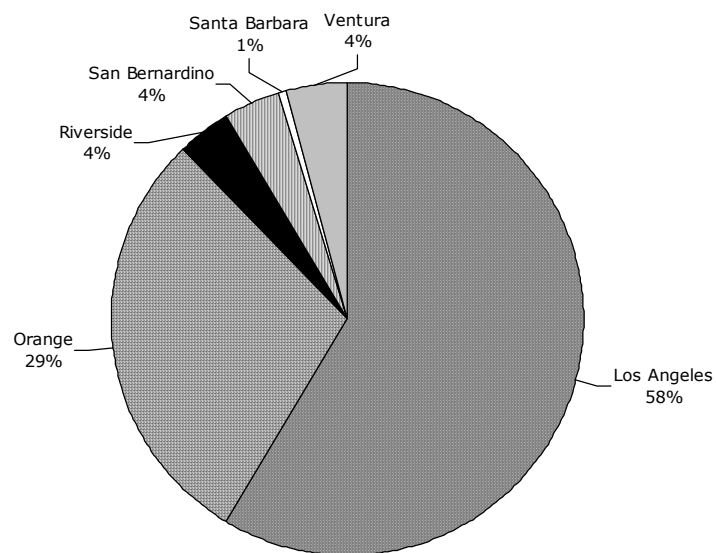


## Greater LA

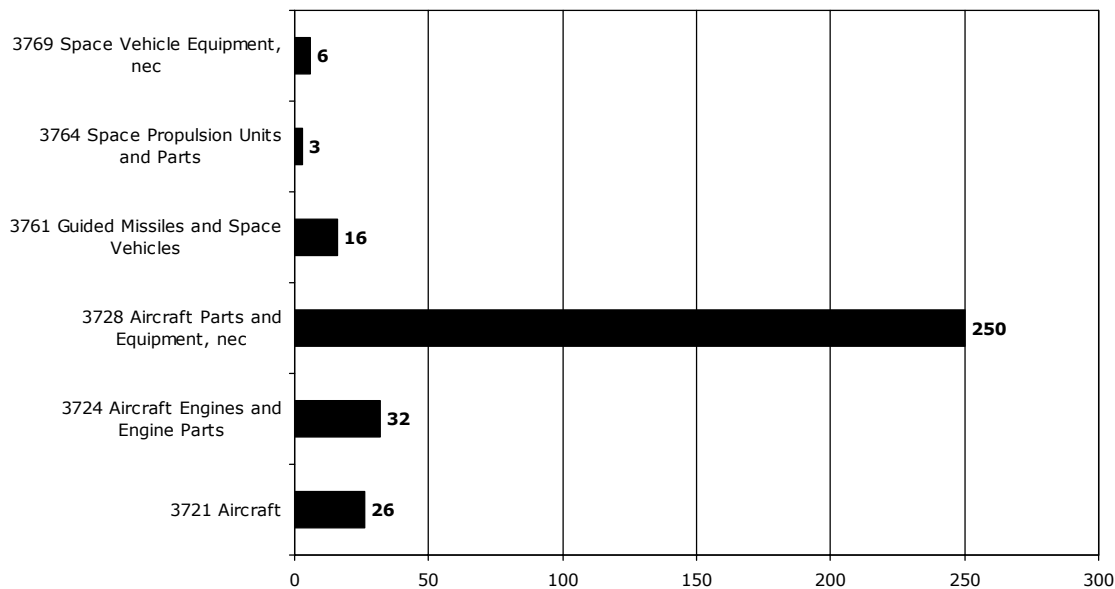
**Figure F-54.**  
**Aerospace Employment by SIC Code**



**Figure F-55.  
Aerospace Companies by County**

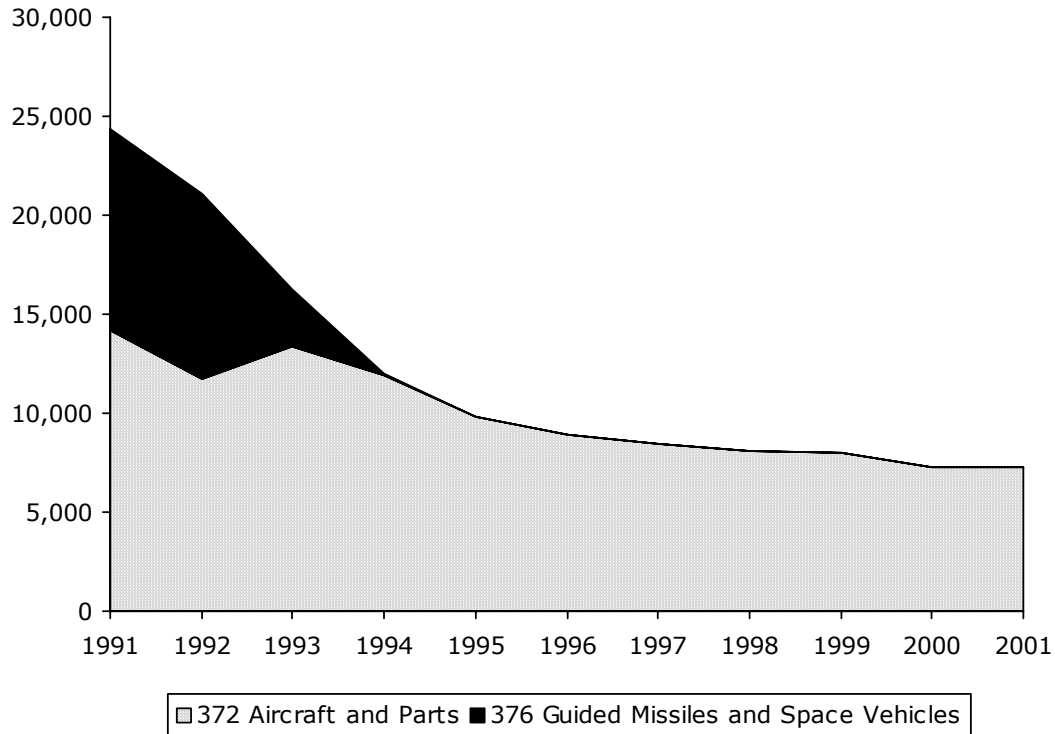


**Figure F-56.  
Number of Aerospace Companies by SIC Code**

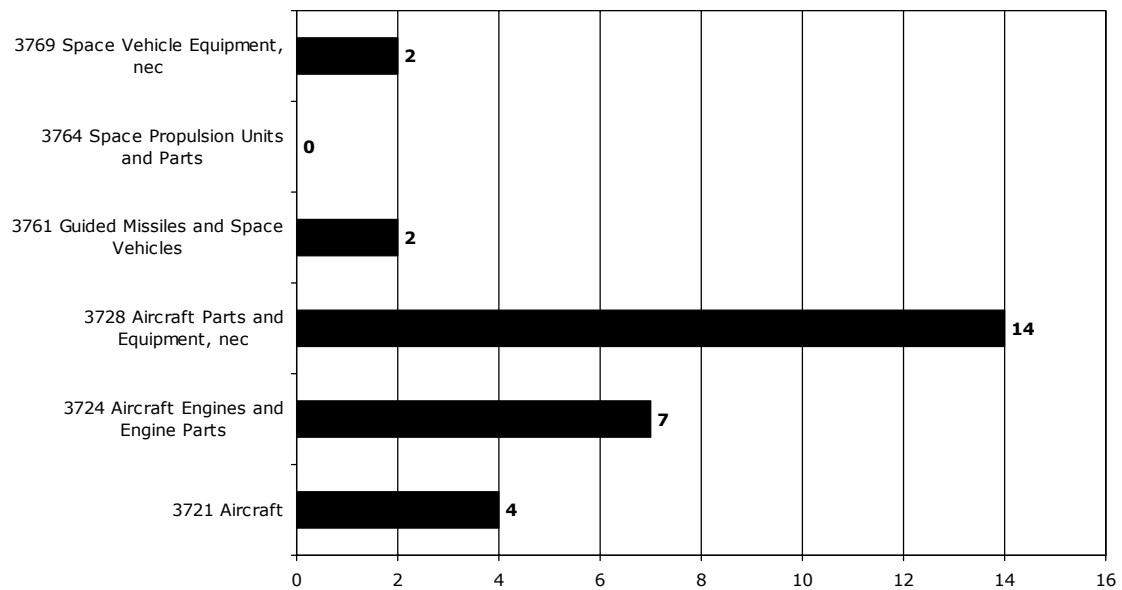


**San Diego**

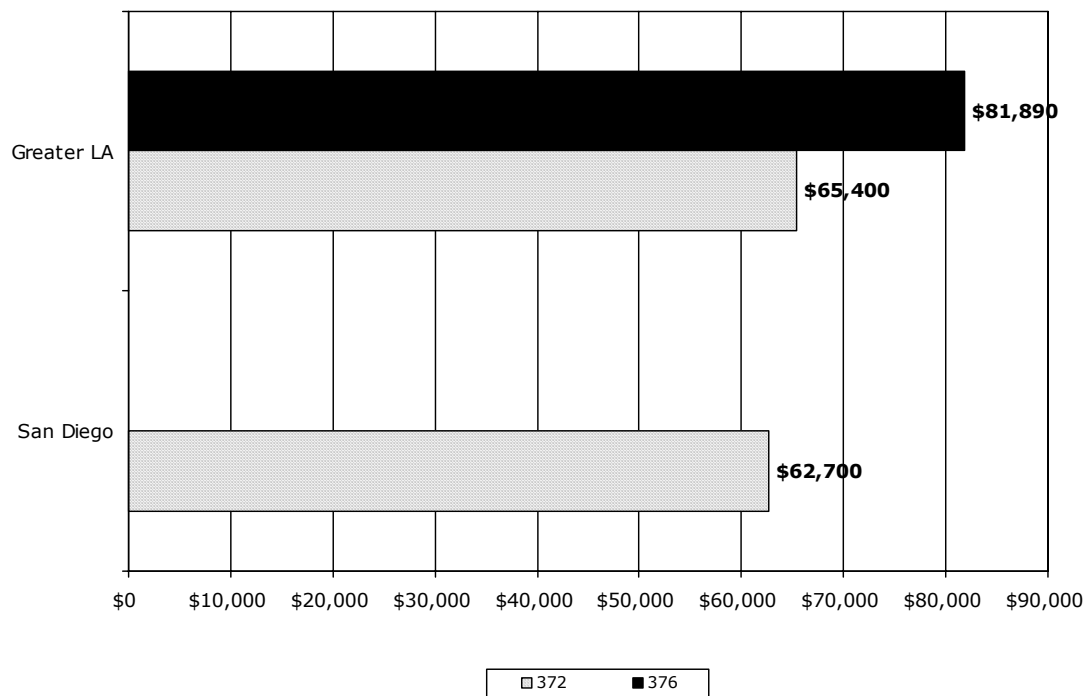
**Figure F-57.  
Aerospace Employment by SIC Code**



**Figure F-58.  
Number of Aerospace Companies by SIC Code**



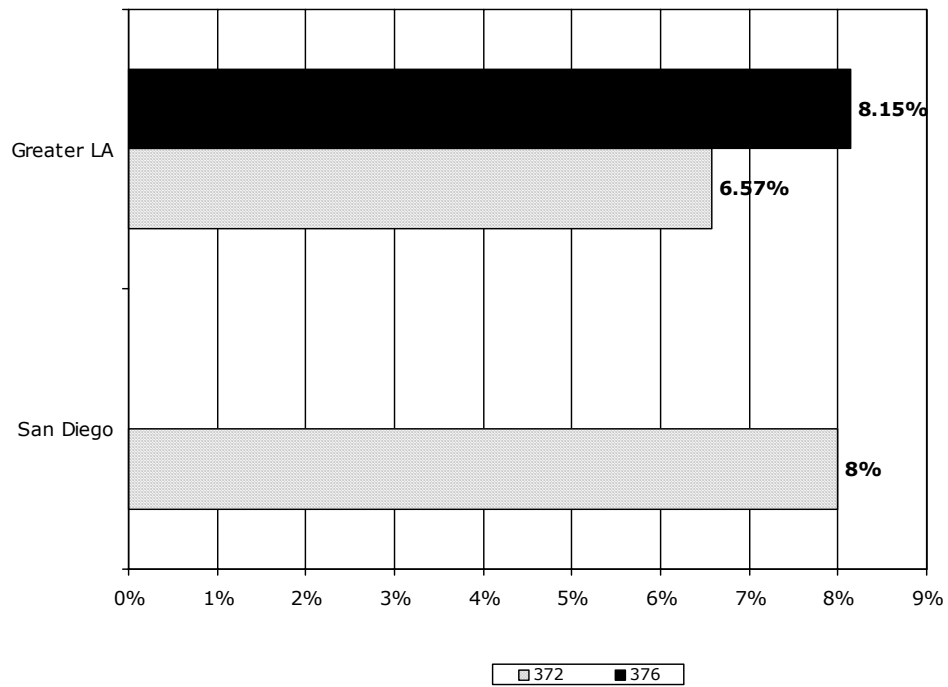
**Figure F-59.**  
**Average Annual Pay per Employee in Aerospace**



Note: San Diego employment in SIC 376 has fallen to zero.

Note: Average annual pay includes bonuses, the cash value of meals and lodging when supplied, tips and other gratuities, employer contributions to certain deferred compensation plans, such as 401(k) plans, and stock options.

**Figure F-60.  
Annual Growth in Labor Productivity**



Note: San Diego employment in SIC 376 has fallen to zero.

## G. UC Spending Impacts Charts and Tables

### Baseline Forecasts

**Figure G-1.**  
**REMI Baseline Forecasts**

<b>Region</b>	<b>Annual Population Growth Rate, 2002-11</b>	<b>Annual Employment Growth Rate, 2002-11</b>	<b>Annual Real GRP Growth Rate, 2002-11</b>	<b>Annual Labor Productivity Growth Rate, 2002-11</b>	<b>Average Annual Wage, 2011</b>
<b><i>United States</i></b>	<b><i>0.85%</i></b>	<b><i>0.63%</i></b>	<b><i>2.65%</i></b>	<b><i>2.02%</i></b>	<b><i>\$43,186</i></b>
California	0.77%	0.91%	3.25%	2.34%	\$49,774
Bay Area	0.57%	0.49%	3.35%	2.86%	\$64,831
Central Valley	1.01%	1.07%	3.26%	2.19%	\$33,362
Greater LA	0.80%	1.06%	3.24%	2.18%	\$45,745
San Diego	0.85%	0.97%	3.36%	2.39%	\$42,735



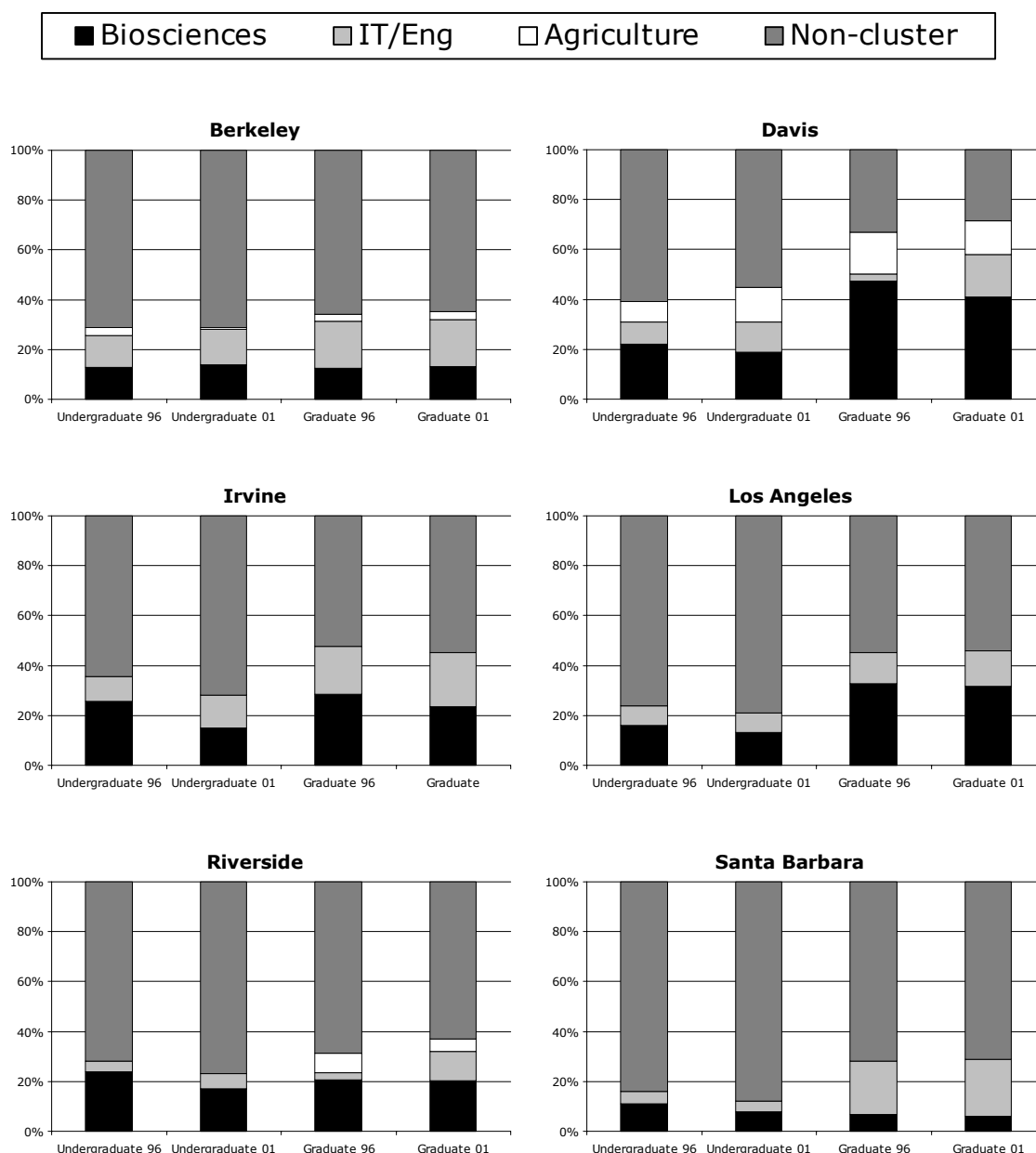


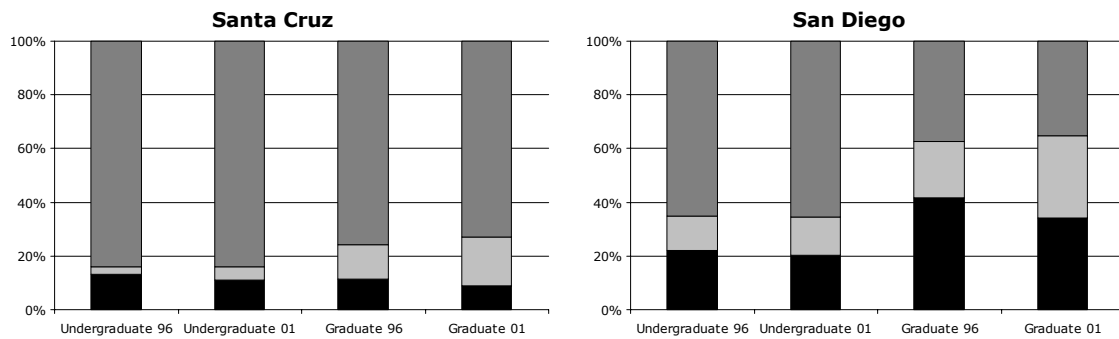
## H. Workforce Impacts Charts and Tables

### Data and Trends on Student Enrollment and Degrees Conferred

#### *Share of Graduating Students in Cluster-Related Fields*

**Figure H-1.**  
Cluster- and Non-cluster-related Degrees Awarded as a Proportion of Total Undergraduate and Graduate Degrees Awarded by UC campus





## Women and Minority Students

**Figure H-2.**  
**Women as a share of total graduate student enrollment, by discipline, 1999**

Region	Discipline	Percent Women
United States	Engineering	20%
	Computer Science	30%
UCLA	Engineering	16%
	Computer Science	11%
UC Santa Cruz	Engineering	11%
	Computer Science	32%

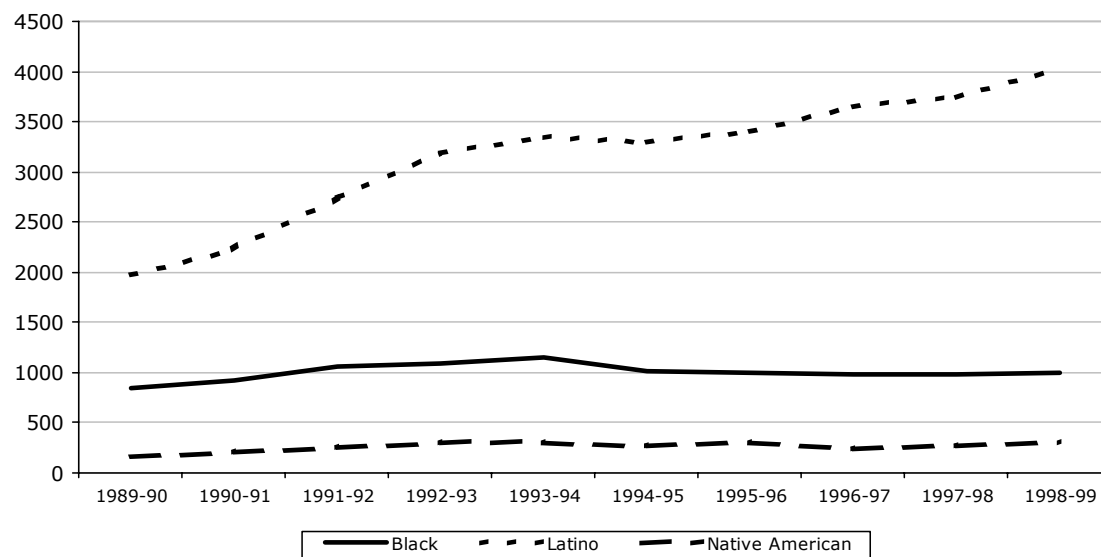
**Figure H-3.**  
**Undergraduate Women Degree Conferral Statistics by Cluster-Related Disciplines,**  
**1995-96 and 2000-01**

UC Campus	Discipline	1995-96 Number of Degree Conferrals	1995-96 Share of Total Degree Conferrals	2000-01 Number of Degree Conferrals	2000-01 Share of Total Degree Conferrals
Berkeley	IT and Engineering	160	22%	211	26%
	Biosciences	355	50%	462	58%
Davis	IT and Engineering	74	21%	132	24%
	Biosciences	476	55%	544	61%
Irvine	IT and Engineering	53	18%	96	22%
	Biosciences	416	53%	270	54%
Los Angeles	IT and Engineering	88	19%	112	22%
	Biosciences	407	43%	462	57%
Riverside	IT and Engineering	16	26%	13	11%
	Biosciences	181	50%	171	51%
San Diego	IT and Engineering	71	17%	118	22%
	Biosciences	386	52%	403	52%
San Francisco	Biosciences	53	59%	20	95%
Santa Barbara	IT and Engineering	22	11%	30	15%
	Biosciences	233	49%	202	56%
Santa Cruz	IT and Engineering	19	28%	28	24%
	Biosciences	177	59%	175	61%
<b>Systemwide Total</b>	<b>IT and Engineering</b>	<b>503</b>	<b>20%</b>	<b>740</b>	<b>23%</b>
	<b>Biosciences</b>	<b>2684</b>	<b>51%</b>	<b>2709</b>	<b>56%</b>

**Figure H-4.  
Graduate Women Degree Conferrals in Cluster-Related Disciplines**

UC Campus	Discipline	1995-96 Number of Degree Conferrals	1995-96 Share of Total Degree Conferrals	2000-01 Number of Degree Conferrals	2000-01 Share of Total Degree Conferrals
Berkeley	IT and Engineering	126	21%	102	20%
	Biosciences	237	61%	229	66%
Davis	IT and Engineering	24	10%	50	23%
	Biosciences	238	56%	202	54%
Irvine	IT and Engineering	28	19%	35	22%
	Biosciences	54	40%	63	48%
Los Angeles	IT and Engineering	46	16%	55	20%
	Biosciences	404	58%	477	58%
Riverside	IT and Engineering	4	44%	25	54%
	Biosciences	19	34%	28	57%
San Diego	IT and Engineering	23	15%	44	24%
	Biosciences	58	48%	111	44%
San Francisco	Biosciences	426	67%	440	70%
Santa Barbara	IT and Engineering	28	17%	36	24%
	Biosciences	13	42%	16	40%
Santa Cruz	IT and Engineering	6	17%	13	29%
	Biosciences	24	65%	0	0%
<b>Systemwide Total</b>	<b>IT and Engineering</b>	<b>285</b>	<b>17%</b>	<b>362</b>	<b>23%</b>
	<b>Biosciences</b>	<b>1473</b>	<b>58%</b>	<b>1566</b>	<b>59%</b>

**Figure H-5.**  
**UC First-time Freshmen from California High Schools by Ethnicity, 1990-99**



Source: California Postsecondary Education Commission

**Figure H-6.  
Underrepresented Minorities as Percentage of Total Undergraduate  
Degree-Conferrals in Cluster-related Fields, 1995-96**

<b>UC Campus</b>	<b>Discipline</b>	<b>American Indian</b>	<b>African American</b>	<b>Hispanic</b>
Berkeley	IT and Engineering	0%	2%	4%
	Biosciences	0%	2%	5%
Davis	IT and Engineering	1%	3%	6%
	Biosciences	2%	2%	7%
Irvine	IT and Engineering	0%	0%	6%
	Biosciences	0%	1%	5%
Los Angeles	IT and Engineering	0%	3%	8%
	Biosciences	1%	1%	7%
Riverside	IT and Engineering	0%	3%	8%
	Biosciences	0%	1%	8%
San Diego	IT and Engineering	1%	1%	10%
	Biosciences	1%	2%	7%
San Francisco	Biosciences	2%	3%	6%
Santa Barbara	IT and Engineering	1%	3%	11%
	Biosciences	1%	2%	6%
Santa Cruz	IT and Engineering	1%	3%	6%
	Biosciences	1%	3%	10%

**Figure H-7.**  
**Underrepresented Minorities as Percentage of Total Undergraduate**  
**Degree-Conferrals in Cluster-related Fields, 2000-01**

UC Campus	Discipline	American Indian	African American	Hispanic
Berkeley	IT and Engineering	0%	1%	5%
	Biosciences	0%	2%	6%
Davis	IT and Engineering	0%	2%	3%
	Biosciences	1%	2%	8%
Irvine	IT and Engineering	0%	1%	6%
	Biosciences	0%	1%	7%
Los Angeles	IT and Engineering	0%	3%	7%
	Biosciences	1%	5%	9%
Riverside	IT and Engineering	0%	3%	8%
	Biosciences	1%	3%	8%
San Diego	IT and Engineering	0%	1%	7%
	Biosciences	1%	1%	9%
San Francisco	Biosciences	0%	5%	19%
Santa Barbara	IT and Engineering	1%	1%	9%
	Biosciences	1%	2%	10%
Santa Cruz	IT and Engineering	1%	2%	6%
	Biosciences	2%	1%	11%

**Figure H-8.  
Underrepresented Minorities as Percentage of Total Graduate  
Degree-Conferrals in Cluster-related Fields, 1995-96**

<b>UC Campus</b>	<b>Discipline</b>	<b>African American</b>	<b>Hispanic</b>
Berkeley	IT and Engineering	3%	6%
	Biosciences	6%	5%
Davis	IT and Engineering	1%	6%
	Biosciences	2%	7%
Irvine	IT and Engineering	0%	7%
	Biosciences	5%	17%
Los Angeles	IT and Engineering	1%	3%
	Biosciences	6%	7%
Riverside	IT and Engineering	0%	0%
	Biosciences	0%	6%
San Diego	IT and Engineering	2%	2%
	Biosciences	4%	7%
San Francisco	Biosciences	4%	6%
Santa Barbara	IT and Engineering	1%	2%
	Biosciences	3%	7%
Santa Cruz	IT and Engineering	0%	7%
	Biosciences	0%	3%



**Figure H-9.**  
**Underrepresented Minorities as Percentage of Total Graduate Degree-Conferrals in Cluster-related Fields, 2000-01**

UC Campus	Discipline	African American	Hispanic
Berkeley	IT and Engineering	5%	5%
	Biosciences	2%	4%
Davis	IT and Engineering	1%	5%
	Biosciences	1%	4%
Irvine	IT and Engineering	1%	9%
	Biosciences	0%	5%
Los Angeles	IT and Engineering	0%	3%
	Biosciences	5%	9%
Riverside	IT and Engineering	0%	3%
	Biosciences	0%	3%
San Diego	IT and Engineering	2%	5%
	Biosciences	0%	7%
San Francisco	Biosciences	5%	8%
Santa Barbara	IT and Engineering	0%	3%
	Biosciences	0%	5%
Santa Cruz	IT and Engineering	5%	9%
	Biosciences	0%	0%

## How Degrees Translate into Employment

### *National Science Foundation/ Bureau of Labor Statistics Employment Forecasts*

**Figure H-10.**  
**Employment Forecasts for Selected Professions**

Occupation	2000	2010	% Change
All Occupations	145,571	167,754	15.2%
All S&E occupations	4,706	6,904	46.7%
Life scientists	184	218	18.5%
Computer specialists	2,318	4,213	81.8%
Engineers	1,465	1,603	9.4%

Source: National Science Foundation/Bureau of Labor Statistics

## **Benchmarking UC with the United States**

**Figure H-11.**  
**Trends in Biological and Agricultural Sciences Degrees Awarded**

	1996	1998	Average Annualized Percent Change
U.S. Undergraduates	71,470	85,079	4.1%
	1996	2001	Average Annualized Percent Change
UC Undergraduates	5,522	5,395	-0.5%

Sources: National Science Foundation, University of California

## **From Enrollment to Employment**

**Figure H-12.**  
**Employed S&E degree-holders in jobs closely related to highest degree (1999)**

Highest Degree	Percentage Employed in a "Closely Related" Field
Bachelor	42.1%
Master	67.8%
Ph.D.	73.6%

## Residence and Occupation Information

**Figure H-13.**  
Tracked UC Alumni Residing in California, by Campus

	Berkeley	Davis	Irvine	Santa Cruz	San Diego	Riverside
Total Alumni on Record	472,759	138,150	73,673	50,139	86,197	49,346
Living in California	254,689	107,614	51,526	33,386	63,006	32,236
Percentage in CA	54%	78%	70%	67%	73%	65%

Source: Alumni departments at respective campuses. Note: UC Berkeley considers alumni to be graduates as well as those who pursued a degree but never completed.

## Modeling the Economic Impact of Employees with UC Degrees on Clusters

### Graduate Student Impact

**Figure H-14.**  
Percent of Employed S&E degree holders in jobs closely related to highest degree, by highest graduate degree attained

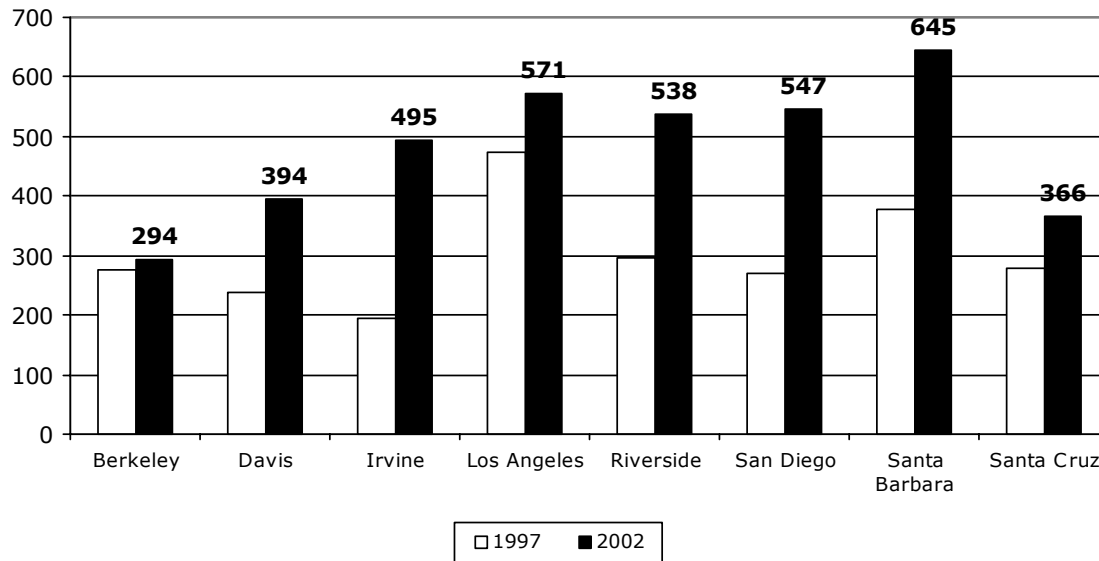
NSF Data Classifications	Masters	Ph.D.
Science and Engineering	67.8%	73.6%
Science and Engineering, excluding Postsecondary Teachers	59.3%	30.8%

**Figure H-15.**  
UC Cluster-related Graduate Students Entering California's S&E Workforce, by Region

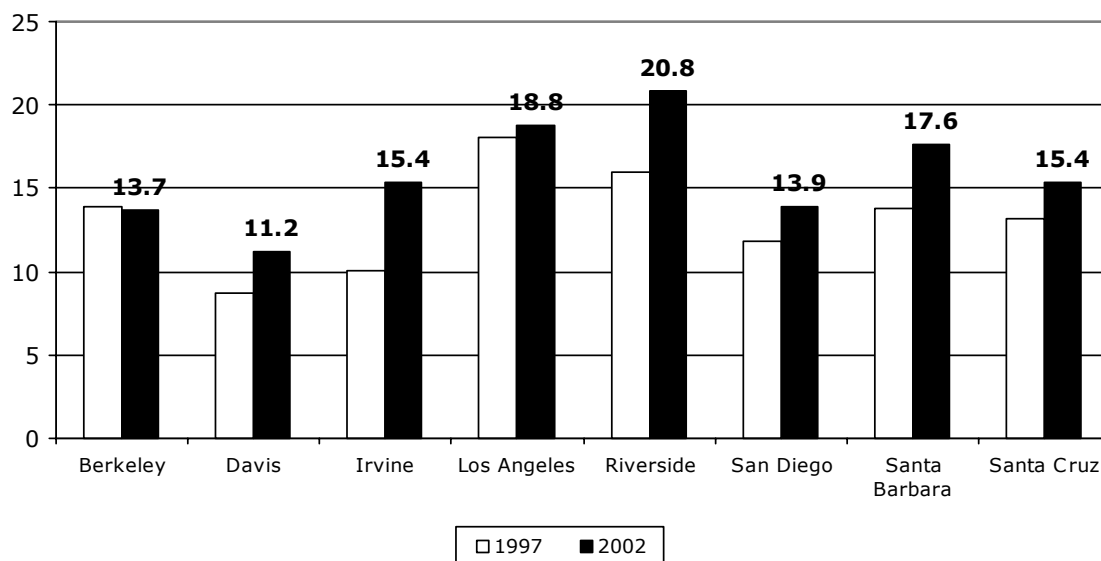
Region	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bay Area	249	264	280	297	315	334	354	375	398	422	447
Greater LA	302	320	339	359	381	404	428	454	482	511	541
San Diego	86	92	97	103	109	116	123	130	138	146	155
Central Valley	67	71	76	80	85	90	95	101	107	114	121
<b>Total</b>	<b>704</b>	<b>746</b>	<b>791</b>	<b>839</b>	<b>890</b>	<b>943</b>	<b>1,000</b>	<b>1,061</b>	<b>1,125</b>	<b>1,192</b>	<b>1,264</b>

## California Community College Access to UC

**Figure H-16.**  
**New Admitted Chicano/Latino California**  
**Resident Community College Transfers, by Campus**



**Figure H-17.**  
**New Admitted Chicano/Latino California Resident Community College**  
**Transfer Admits as Proportion of California Resident Admissions**



**Figure H-18.**  
**Community College Graduates and Transfers to UC**

Year	Community College Graduates	Transfers to UC
1990-91	58,665	10,032
1998-99	96,490	10,161

## Continuing Education and Skills Upgrading

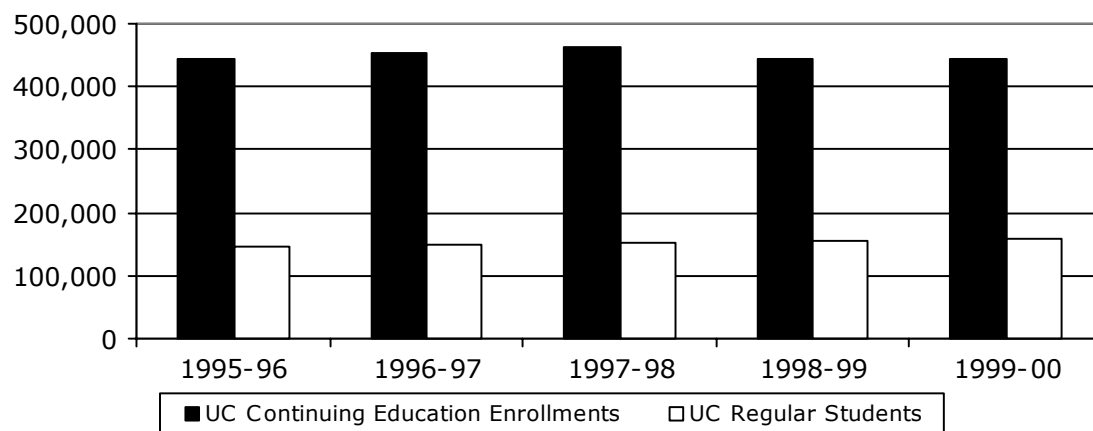
**Figure H-19.**  
**U.S. and California Enrollment Statistics**

Fiscal Year	UC Continuing Education	CSU Continuing Education	California Community Colleges
1995-96	443,376	199,824	1,203,816
1996-97	453,328	229,070	1,305,380
1997-98	463,462	247,533	1,314,680
1998-99	444,492	235,846	1,331,758
1999-00	442,631	262,648	1,400,954

Sources: 1999-2000 UCOP Annual Statistical and Financial Report on University of California Extension and Statewide Programs; 1995-2000 CSU Annual Statistical Reports, CSU Chancellor's Office, Analytical Division; California Postsecondary Education Commission, Student Profiles, 2000.

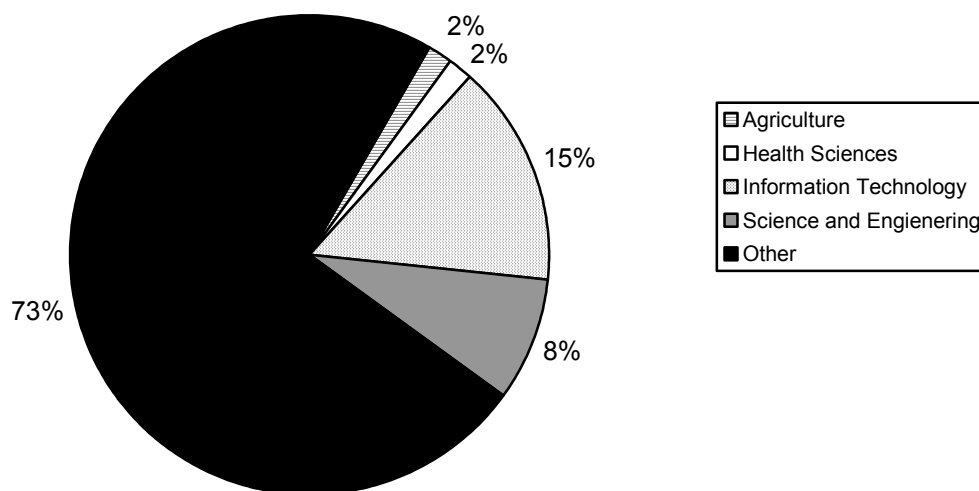
## UC Extension

**Figure H-20.**  
**UC Continuing and Regular Enrollments**



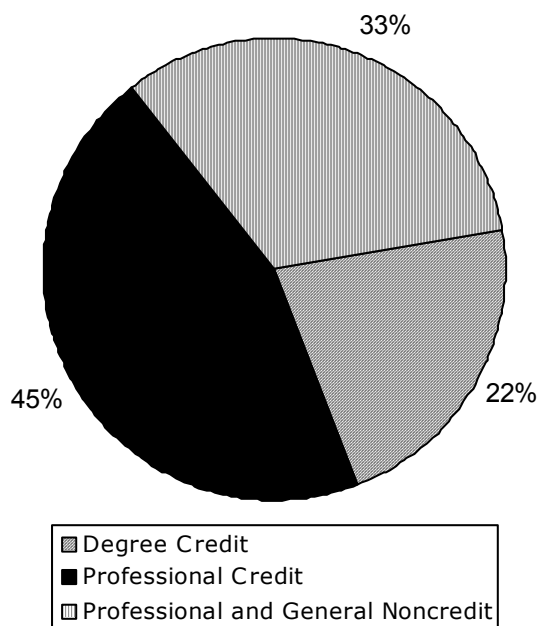
Source: UCOP

**Figure H-21.**  
**UC Continuing Education Enrollment by Subject Area, 2000**



***Continuing Education in the Bay Area:  
UC Berkeley Extension Case Study***

**Figure H-22.**  
**UC Berkeley Extension Courses by Credit Type**



## Training Innovators and Entrepreneurs

### *Summary Statistics*

**Figure H-23.**  
**Spin-off Companies by OTT Classification**

<b>Classification</b>	<b>Number of Companies</b>	<b>Percentage of Total</b>
Advanced Materials	8	7.7%
Biotech	33	31.7%
Chemicals	1	1.0%
Computer Hardware	2	1.9%
Energy	2	1.9%
Medical Devices	6	5.8%
Pharmaceuticals	31	29.8%
Photonics	10	9.6%
Software	8	7.7%
Testing and Measurements	3	2.9%





# I. Technology Impacts Charts and Tables

## The Dynamic Economic Impact of UC Research

### *Baseline Forecasts and TFP Calculations*

**Figure I-1.**  
**REMI Baseline Forecasts Used to Calculate Labor Productivity**  
**Growth Rates for California and Each of Its Regions**

Region	Annual Population Growth Rate, 2002-11	Annual Employment Growth Rate, 2002-11	Annual Real GRP Growth Rate, 2002-11	Annual Labor Productivity Growth Rate, 2002-11	Average Annual Wage, 2011
<b>United States</b>	<b>0.85%</b>	<b>0.63%</b>	<b>2.65%</b>	<b>2.02%</b>	<b>\$43,186</b>
California	0.77%	0.91%	3.25%	2.34%	\$49,774
Bay Area	0.57%	0.49%	3.35%	2.86%	\$64,831
Central Valley	1.01%	1.07%	3.26%	2.19%	\$33,362
Greater LA	0.80%	1.06%	3.24%	2.18%	\$45,745
San Diego	0.85%	0.97%	3.36%	2.39%	\$42,735

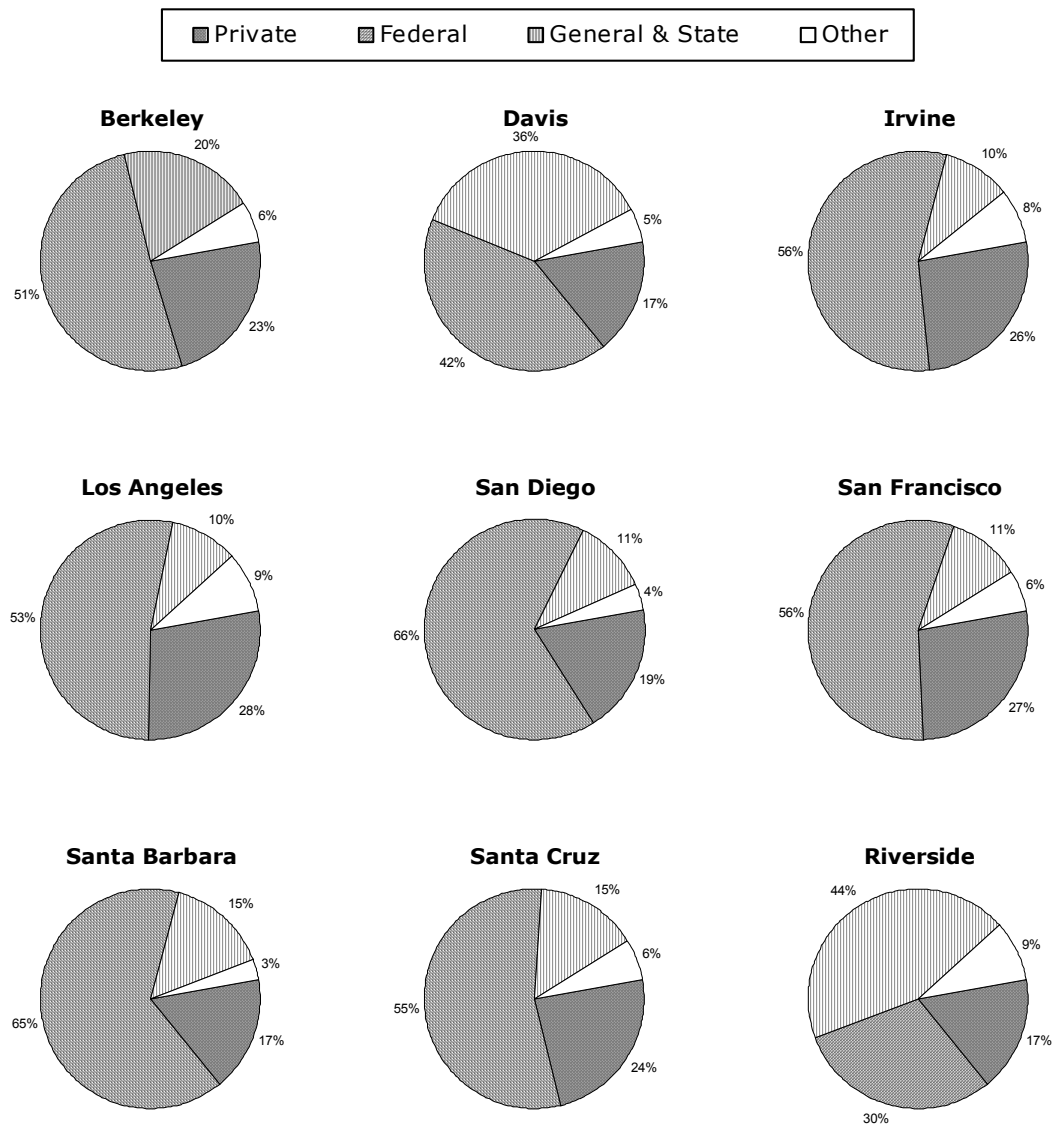
**Figure I-2.**  
**Total Factor Productivity Calculations**

Region	Annual Real GRP Growth Rate, 2002-11	Annual Labor Productivity Growth Rate, 2002-11	Annual Growth in Capital Stock and Capital Quality, 2002-11	Annual Total Factor Productivity Growth Rate, 2002-11	TFP Growth as Share of GRP Growth
United States	2.65%	2.02%	1.49%	0.53%	0.20%
California	3.25%	2.34%	1.49%	0.85%	0.26%

# Research Expenditures by Source

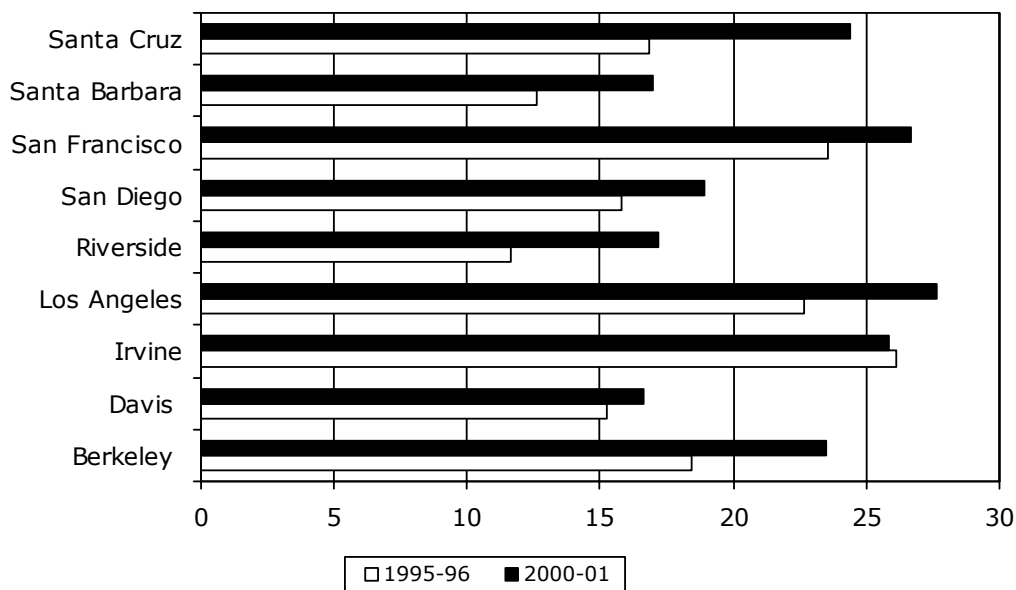
**Figure I-3.**  
**UC Campus Funding Sources, FY 2000-01**

*(Note: "Other" includes sources such as tuition and fees, reserves, endowment, and sales and services of educational activities and auxiliary enterprises such as medical school hospitals)*

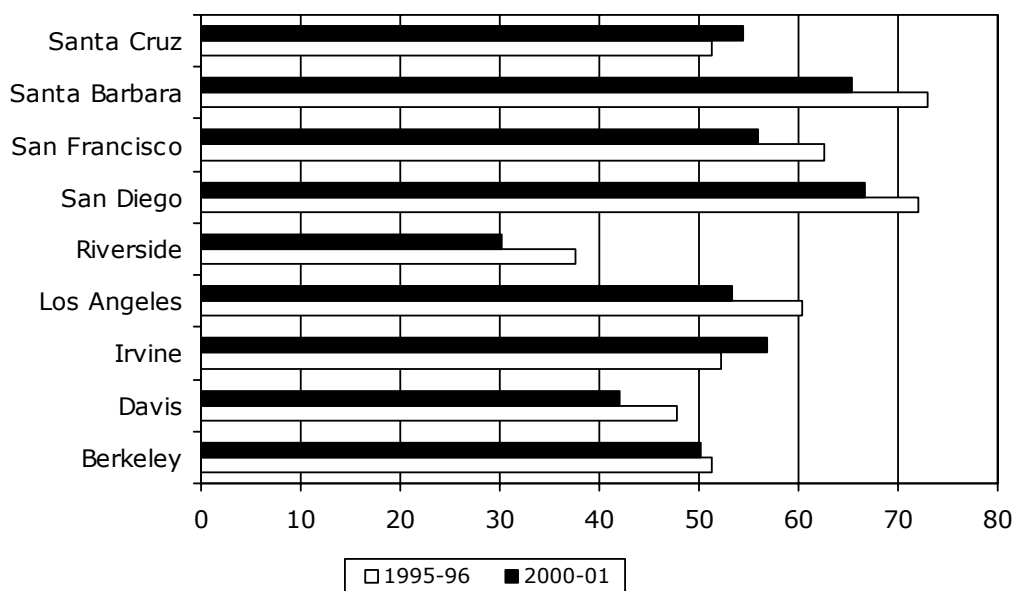


## Evolution of Expenditures

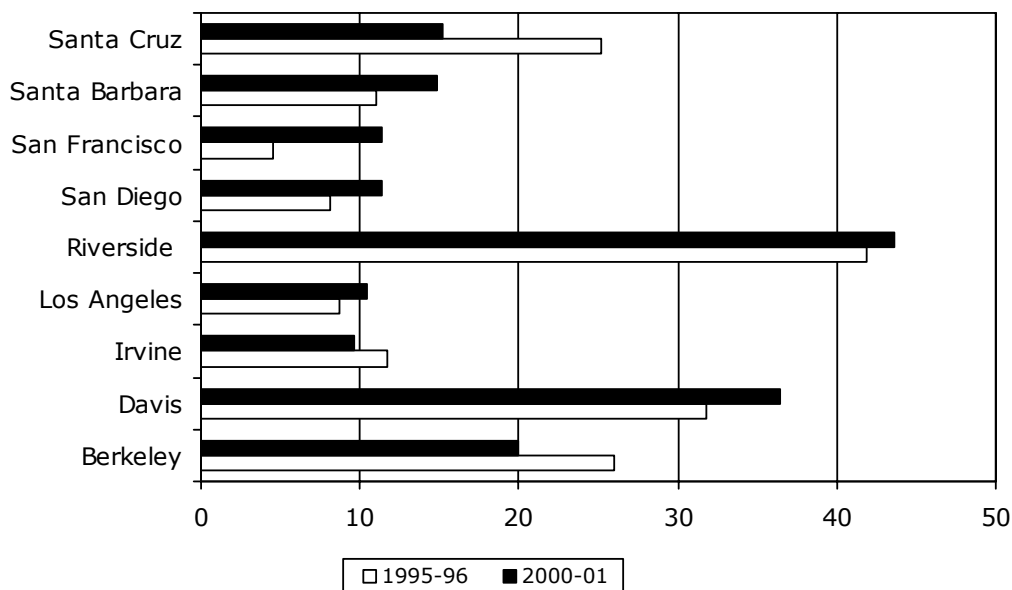
**Figure I-4.**  
**Share of Research Expenditures from Private Sector Sources by UC Campus**



**Figure I-5.**  
**Share of Research Expenditures from Federal Sources by UC Campus**



**Figure I-6.**  
**Share of Research Expenditures from**  
**State and General Fund Sources by UC campus**



### ***Private Sector Research Funds***

**Figure I-7.**  
**UC Berkeley Contracts and Grants, 2000-01**

Type	Contract	Contract Amount
Private	Microelectronics Advanced Research Corp.— Design and Test of Gigascale Integrated Systems	6,733,000
Private	Semiconductor Research Corporation— Lithography for Terascale Electronics	4,900,000
Private	Realtimehealth, Inc.— Microfabricated High Performance Immunoanalyzers	829,000

*Berkeley is the only campus that reports the total value of the contract,  
not the amount spent in each year.*

**Figure I-8.**  
**UC Davis Top Contracts and Grants by Source, 2000-01**

Type	Contract	Contract Amount
Private	AstraZeneca—Study of pulmonary problems in Costa Rican farm workers	799,000
Private	Mars, Inc.—Cardiovascular benefits of certain cocoa polyphenols	654,000
Private	Allergan—Glaucoma clinical trials	358,000

**Figure I-9.**  
**UC Irvine Top Contracts and Grants by Source, 2000-01**

Type	Contract	Contract Amount
Private	Pharmdel, Inc.—Diabetes Research	416,000
Private	Electric Power Research Institute—Evaluation of Corrosion Control Using Regenerative Biofilms	351,000
Private	Eli Lilly—ADHD study	323,000

**Figure I-10.**  
**UCLA Top Contracts and Grants by Source, 2000-01**

Type	Contract	Contract Amount
Private	Ceres, Inc.—Virtual Seed Institute	1,865,000
Private	Hewlett-Packard—The Defect-Tolerant Moletronics Consortium	1,654,000
Private	Novartis—Leukemia study	1,277,000

**Figure I-11.**  
**UC Riverside Top Contracts and Grants by Source, 2000-01**

Type	Contract	Contract Amount
Private	Tata Sons Ltd.—Infrastructure Support for Network-Based Content Delivery	654,000
Private	Honda—Program for the Study of Extremely Low-Emission Vehicles	300,000
Private	The Bugher Foundation—Study of Vascular Formation	242,000

**Figure I-12.  
UC San Diego Top Contracts and Grants by Source, 2000-01**

Type	Contract	Contract Amount
Private	Alza Corporation—Bladder Origin Pelvic Pain	834,000
Private	Virologic, Inc.—Clinical Strategy of HIV-1 Phenotypic Resistance	716,000
Private	Northrup Grumman Corp.—Programming Environments and Training Program	640,000

**Figure I-13.  
UC San Francisco Top Contracts and Grants by Source, 2000-01**

Type	Contract	Contract Amount
Private	Onyx Pharmaceuticals—Viral Methods for Treating Cancer	1,479,000
Private	GlaxoSmithKline—Study of Patients Receiving Combination Therapy	1,055,000
Private	Genentech—Study of Efficacy and Safety of anti-CD11 (cardiovascular drug)	993,000

**Figure I-14.  
UC Santa Barbara Top Contracts and Grants by Source, 2000-01**

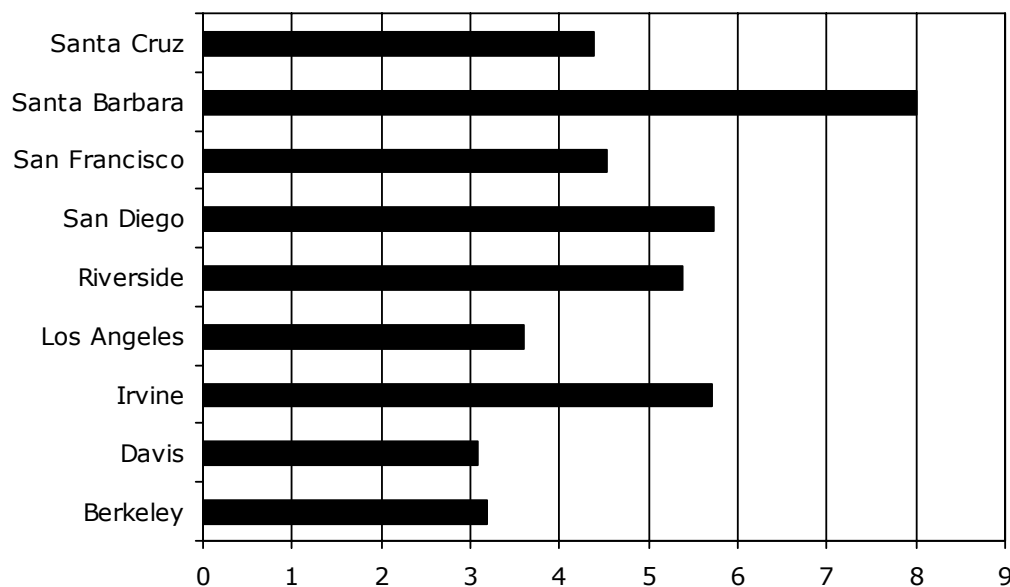
Type	Contract	Contract Amount
Private	Mitsubishi Chemical Center for Advanced Materials	10,375,000
Private	Walsin Lihwa Corporation—3D Photonic Integrated Circuits	1,892,000
Private	Geltex Pharmaceuticals, Inc.—Preparation of Polyamino Acids for Pharmaceutical Application	331,000

**Figure I-15.  
UC Santa Cruz Top Contracts and Grants by Source, 2000-01**

Type	Contract	Contract Amount
Private	<i>Did not have award of more than \$200K in 2000-01</i>	

## Invention Disclosures, Patents, Licenses, Start Ups *From Research to Technology Transfer*

**Figure I-16.**  
**Invention Disclosures Per \$10 million in Research Expenditure  
by Campus, 1998-99 through 2000-01**



### ***Company Briefs: Companies founded by UC Faculty/Students or based on UC Technologies***

#### **Chiron Corporation**

- **Year Founded:** 1981.
- **Founders:** Three UC biochemistry professors: William Rutter of UC San Francisco and two of his former students, Edward Penhoet of UC Berkeley and Pablo Valenzuela of UC San Francisco.
- **Founding UC Technology:** The cloning of Hepatitis B antigens, performed in the UC San Francisco department of Biochemistry and Biophysics. These antigens were used to develop the first genetically engineered vaccine.
- **Company Revenues (2001):** \$1.14 billion, 53% from outside of the United States. One of the largest biotech companies in the world.
- **Employees:** 3700, including 2100 in the U.S. and 1500 in its Emeryville headquarters complex.
- **Key Breakthroughs that Impact Californians' Quality of Life:** From initial work on vaccines, the company diversified into biopharmaceuticals and blood testing.

- Chiron scientists cloned the hepatitis C virus (HCV), and contributed to the development of a blood-screening test for this leading cause of liver disease. This test has largely eliminated new cases of blood transfusion-transmitted infections of hepatitis C. There are approximately 4.5 million people in the United States that are infected with Hepatitis C, 500,000 in California, and perhaps as many as 200 million around the world. The average lifetime cost for hepatitis C, in the absence of liver transplant, has been estimated to be about \$100,000 for individual patients. The annual health care costs for the affected U.S. population with chronic hepatitis C may be as high as \$9 billion—or \$1 billion annually in California.
- In 1984, Chiron became the first company to clone and sequence the entire genome of HIV. This enabled scientists around the world to study the structure of the virus and develop more effective treatments, impacting thousands of people around the country.
- The company has developed products for diseases that affect thousands of Californians including:
  - Cystic Fibrosis
  - Multiple Sclerosis
  - Skin and Kidney Cancer
  - Meningitis
  - Encephalitis
  - Flu
  - HIV-1
  - Hepatitis B
- One of Chiron’s major biopharmaceutical products is TOBI (tobramycin solution for inhalation) for lung infections in cystic fibrosis patients. CF affects approximately 30,000 people in the United States, an estimated 3000-4000 in California.
- Another is Proleukin (aldesleukin) for kidney and skin cancer. Approximately 50,000 people in the U.S. are diagnosed with melanoma each year, and melanoma kills almost 8,000 people a year in the U.S.—more than 1,000 in California. Proleukin boosts the body’s natural immune system to fight cancer, and it was the first therapy approved for the treatment of metastatic melanoma in 20 years. Proleukin can lead to long-term remission for certain cancers.
- Another product is Betaseron (interferon beta-1b) for multiple sclerosis. It is believed that there are approximately 350,000 people in the United States with MS diagnosed by a physician. This estimate suggests that approximately 200 new cases are diagnosed each week—approximately 25 in California, according to the national institute of neurological disorders and stroke.



- The company’s major vaccines include:
  - Menjugate, for meningococcal C disease
  - Flud and Begrivac, flu vaccines
  - Encepur, a vaccine against tick-borne encephalitis

**Other breakthroughs from the UC San Francisco Department of Biochemistry and Biophysics include:**

- Recombinant DNA and genetic engineering technology, which has an infinitely wide range of applications from vaccines to disease-resistant plants.
- The cloning of the human insulin gene (Rutter).
- The synthesis of human growth hormone (Choh Hao Li).
- The discovery of oncogenes, which are normal genes that control growth in every living cell, but which under certain conditions, can turn renegade and cancerous. This has led to great advances in the understanding, diagnosis, and treatment of over 50 types of cancers. (Harold Varmus and Michael Bishop).

**Inktomi Corporation**

- **Year Founded:** 1986.
- **Founders:** Dr. Eric Brewer, an assistant professor of computer science at UC Berkeley, and Paul Gauthier, a graduate student in the computer science Ph.D. program.
- Several Berkeley professors and affiliates have held positions on the company's Technology Advisory Board, including:
  - Dr. James Gray, a Berkeley Ph.D. at Microsoft Research, who is a specialist in database and transaction processing computer systems.
  - Dr. Lawrence Rowe, a Berkeley EE/CS professor who is the founding director of the Berkeley Multimedia Research center.
  - Dr. David Culler, a Berkeley CS professor who researches parallel architectures, programming languages and operating systems.
- **Founding UC Technology:** a parallel-processing technology that combines groups of desktop computers into a "network of workstations" with supercomputing capabilities. This power was harnessed to creating the Internet's first high-performance, scalable search engines.
- **Company Revenues (2001):** \$191.5 million. Revenues grew dramatically from \$5.8 million in 1997 to \$223.5 million in 2000.
- **Employees:** approximately 300. There were layoffs in 2001 but employment has stabilized.
- **Cluster Affiliations:** Inktomi is a classic example of an exporting company firmly rooted in a cluster network that draws dollars into its home region (the Bay Area).
- Inktomi has hardware partnerships with Compaq, Dell, Fujitsu, F5 Networks, Hewlett Packard and 3Com.
- It has also technology partnerships with numerous companies, including many in the Bay Area, such as Apple, Oracle, Sun, Sybase and dozens of smaller companies
- **Did You Know?** Pronounced "ink-to-me," the company name is derived from a mythological spider of the Plains Indians known for bringing culture to the people.
- Inktomi's two major units of business are the Content Networking Platform, which encompasses network caching, content distribution, media broadcasting and wireless technologies, and Search Solutions, which include Web Search and Enterprise Search.

- **Breakthroughs that Impact Californians Every Day:** Inktomi powers the search box found on the world's top portal sites, reaching more than 80% of the Internet population. Some portal partners include:
  - About.com, AOL, HotBot, iWon.com, Looksmart, MSN.com, TerraNetworks, and Yahoo Enterprise Solutions.
- In early 2002, Inktomi hit a milestone of processing more than 100 million search queries a day through these various portals.
- Eight of the top ten Fortune 500 companies, along with 2,500 others, have deployed Inktomi Search on their corporate intranets and public web sites.

**Other research programs and institutes within the UC Berkeley Division of Computer Science that have the potential or widespread impacts:**

- Berkeley Multimedia Research Center: Brings together a wide range of people from artists to programmers to explore content delivery. A focus area is the study of interactive courseware, distance learning models, and new classroom and working environments.
- Berkeley Northside Research Group: pulls together the areas of hardware, software, operating systems, networking and graphics to create computer systems on the cutting edge of technology. A current project (and a current focus area of Eric Brewer) is developing a new architecture for future telecommunications services that supports “the dynamic confederation of sometimes collaborating and sometimes competing” service providers.
- Berkeley Sensor and Actuator Center: a cooperative research center funded by the NSF, private industry, and government. Researches sensors and miniature moving mechanical elements or MEMS (MicroElectroMechanical Systems) that have a wide variety of potential applications.
- Berkeley Wireless Research Center: another industry-department partnership that researches technologies for next-generation wireless communication systems.
- Gigascale Silicon Research Center: long-term research focus on chip design.

### Agility Communications

- **Year Founded:** 1998.
- **Founders:** Dr. Larry Coldren is a professor in the Electrical and Computer Engineering Department at UC Santa Barbara and the director of the Heterogeneous Optical Technology Center. He is an expert in vertical-cavity and in-plane laser research and has authored the defining textbook in this field. Dr. Greg Fish, a former student of Coldren's, holds a masters degree and doctorate in electrical engineering from UC Santa Barbara.
- **Founding UC Technology:** Several breakthroughs leading to components of the company's first commercial product. The Agility 3040 is the first high-power, widely tunable laser. It can tune to more than 100 channels in less than 10 milliseconds.
- **Company Performance:** Agility has received almost \$200 million from venture capitalists and strategic investors in its short history.
- Strong relationship with the Electrical and Computer Engineering Department at UC Santa Barbara. Several critical patents crucial to Agility's technology have been exclusively licensed from UC Santa Barbara.
- **Employees:** 230. Headquarters in Santa Barbara; manufacturing facility in Allentown, PA.
- **Market Forecast for Agility's Emerging Technology:** The Dense Wavelength Division Multiplexing (DWDM) optical component market is projected to grow from \$5 billion in 2000 to more than \$10 billion by 2004, according to RHK, Inc., a telecommunications market research firm.

#### Other Highlights from the Electrical and Computer Engineering Department at UC Santa Barbara:

- The department is home to Herbert Kroemer, 2000 Nobel Laureate in Physics. Professor Kroemer's Ph.D. dissertation was on hot-electron effects in the transistor, setting the stage for a career in research on the physics and technology of semiconductors and semiconductor devices. He was the founding member of the group that has made UC Santa Barbara a leading research center in the field.
- In 1990, Larry Coldren co-founded another successful startup, OCI (now Gore Photonics) that focuses on VCSEL development.
- The ECE department focuses research on electronic and photonic materials, devices and circuits, computer engineering, VLSI design and testing, controls, communications and signal processing.
- Centers in this department at UC Santa Barbara are especially geared toward aerospace and telecommunications. They include the Center for Robust Control of Aeroengines, Multidisciplinary Optical Switching Technology Center, the National Nanofabrication Users Network, and the Center for Optical Communications.

## List of Departments and Centers Included in Research Expenditure Calculations

**Figure I-17.**  
**UC Departments and Centers Included in Research Expenditure Calculations**

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
<b>Systemwide</b>	Agriculture	Mosquito Research	Division of Agriculture and Natural Resources
	Agriculture	Integrated Pest Management	Division of Agriculture and Natural Resources
	Agriculture	Genetic Resources	Division of Agriculture and Natural Resources
	Agriculture	Forest Products Laboratory	Division of Agriculture and Natural Resources
	Agriculture	Center for Pest Management Research and Extension	Division of Agriculture and Natural Resources
	Agriculture	Center for Cooperatives	Division of Agriculture and Natural Resources
<b>Berkeley</b>	Aerospace	Space Sciences Laboratory	Campus-wide
	Agriculture	Resource Institutions, Policy, and Management	Agricultural Experiment Station
	Agriculture	Plant Gene Experiment Center	College of Natural Resources
	Agriculture	Plant Biology	Agricultural Experiment Station
	Agriculture	Plant Biology	College of Natural Resources
	Agriculture	Nutritional Sciences	Agricultural Experiment Station
	Agriculture	Nutritional Science and Toxicology	College of Natural Resources
	Agriculture	Microbial Biology	Agricultural Experiment Station
	Agriculture	Insect Biology	Agricultural Experiment Station
	Agriculture	Forestry Center	Agricultural Experiment Station
	Agriculture	Forest Sciences	Agricultural Experiment Station
	Agriculture	Ecosystem Sciences	Agricultural Experiment Station

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Agriculture	CNR Dean Research & Extension	Agricultural Experiment Station
	Agriculture	Agricultural Resource Economics	Agricultural Experiment Station
	Agriculture	Agricultural Resource Economics	College of Natural Resources
	Biosciences	Virus Lab	Campus-wide
	Biosciences	Molecular and Cell Biology	College of Letters and Science
	Biosciences	Integrative Biology	College of Letters and Science
	Biosciences	Institute of Human Development	Campus-wide
	Biosciences	Helen Wills Neuroscience Institute	Campus-wide
	Biosciences	General	School of Optometry
	Biosciences	General	School of Public Health
	Biosciences	Cancer Research Laboratory	Campus-wide
	Biosciences	Bioengineering	College of Engineering
	Computers/Semiconductors	Materials Science and Engineering	College of Engineering
	Computers/Semiconductors	Electronics Research Laboratory	Campus-wide
	Computers/Semiconductors/IT	Electrical Engineering and Computer Science	College of Engineering
	IT	General	School of Information Management and Systems
	IT	Berkeley Multimedia Research Center	Campus-wide
<b>Davis</b>	Aerospace	Mechanical and Aeronautical Engineering	College of Engineering
	Agriculture	Wildlife, Fish, and Conservation Biology	Agricultural Experiment Station
	Agriculture	Viticulture and Enology	Agricultural Experiment Station
	Agriculture	Veterinary Medicine	Agricultural Experiment Station
	Agriculture	Vegetable Crops	Agricultural Experiment Station
	Agriculture	Tropical Diseases	Agricultural Experiment Station
	Agriculture	Textiles and Clothing	Agricultural Experiment Station

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Agriculture	Pomology	Agricultural Experiment Station
	Agriculture	Plant Pathology	Agricultural Experiment Station
	Agriculture	Plant Growth Laboratory	Agricultural Experiment Station
	Agriculture	Plant Biology	Campus-wide
	Agriculture	Nutrition	Agricultural Experiment Station
	Agriculture	Nematology	Agricultural Experiment Station
	Agriculture	Land, Air, and Water Resources	Agricultural Experiment Station
	Agriculture	Human & Community Development	Agricultural Experiment Station
	Agriculture	Global Livestock CRSP	Campus-wide
	Agriculture	General	Agricultural Experiment Station
	Agriculture	Food Science and Technology	Agricultural Experiment Station
	Agriculture	Food Intake Laboratory	Agricultural Experiment Station
	Agriculture	Environmental Toxicology	Agricultural Experiment Station
	Agriculture	Environmental Science and Policy	Agricultural Experiment Station
	Agriculture	Environmental Horticulture	Agricultural Experiment Station
	Agriculture	Environmental Design	Agricultural Experiment Station
	Agriculture	Entomology	Agricultural Experiment Station
	Agriculture	Division of Biological Science	Agricultural Experiment Station
	Agriculture	Center for Engineering Plants for Resistance Against Pathogens	College of Agricultural and Environmental Sciences
	Agriculture	Biological and Agricultural Engineering	Agricultural Experiment Station
	Agriculture	Avian Sciences	Agricultural Experiment Station
	Agriculture	Aquaculture and fisheries	Agricultural Experiment Station
	Agriculture	Animal Science	Agricultural Experiment Station

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Agriculture	Air Shuttle Service	Agricultural Experiment Station
	Agriculture	Agronomy and Range Science	Agricultural Experiment Station
	Agriculture	Agricultural Resource Economics	Agricultural Experiment Station
	Agriculture	Agricultural History Center	Campus-wide
	Agriculture	Agricultural History	Agricultural Experiment Station
	Agriculture	Agricultural Chemistry	Agricultural Experiment Station
	Biosciences	Urology	School of Medicine
	Biosciences	Thoracic Surgery	School of Medicine
	Biosciences	Reproductive Biology	School of Medicine
	Biosciences	Radiation Oncology	School of Medicine
	Biosciences	Psychiatry	School of Medicine
	Biosciences	Plastic Surgery	School of Medicine
	Biosciences	Physical Medicine & Rehabilitation	School of Medicine
	Biosciences	Pharmacology	School of Medicine
	Biosciences	Pediatrics Neonatology	School of Medicine
	Biosciences	Pediatrics	School of Medicine
	Biosciences	Pathology	School of Medicine
	Biosciences	Otolaryngology	School of Medicine
	Biosciences	Orthopedic Surgery	School of Medicine
	Biosciences	Ophthalmology	School of Medicine
	Biosciences	Obstetrics and Gynecology	School of Medicine
	Biosciences	Nuclear Medicine	School of Medicine
	Biosciences	Neurology	School of Medicine
	Biosciences	Neurological Surgery	School of Medicine
	Biosciences	National Biological Services	Campus-wide
	Biosciences	Medical Microbiology and Immunology	School of Medicine
	Biosciences	M.I.N.D. Institute	School of Medicine
	Biosciences	International Nutrition Program	Campus-wide
	Biosciences	Internal Medicine	School of Medicine
	Biosciences	Institute of Toxicology and Environmental Health	Campus-wide
	Biosciences	Human Physiology	School of Medicine
	Biosciences	Human Anatomy	School of Medicine
	Biosciences	General Surgery	School of Medicine



UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Biosciences	General	School of Medicine
	Biosciences	General	Division of Biological Science
	Biosciences	Family Practice	School of Medicine
	Biosciences	Exercise Biology	Division of Biological Science
	Biosciences	Epidemiology & Preventive Medicine	School of Medicine
	Biosciences	Diagnostic Radiology	School of Medicine
	Biosciences	Dermatology	School of Medicine
	Biosciences	Comparative Medicine	School of Medicine
	Biosciences	Center for Neuroscience	Division of Biological Science
	Biosciences	Cancer Center	School of Medicine
	Biosciences	Biotechnology Program	Campus-wide
	Biosciences	Biosystematics	Campus-wide
	Biosciences	Biomedical Engineering	College of Engineering
	Biosciences	Biological Chemistry	School of Medicine
	Biosciences	Anesthesiology	School of Medicine
	Computers/ Semiconductors	Electrical and Computer Engineering	College of Engineering
	IT	Computer Science	College of Engineering
<b>Irvine</b>	Aerospace	Mechanical and Aerospace Engineering	School of Engineering
	Biosciences	Surgery	School of Medicine
	Biosciences	Radiological Sciences	School of Medicine
	Biosciences	Radiation Oncology	School of Medicine
	Biosciences	Psychiatry and Human Behavior	School of Medicine
	Biosciences	Physiology and Biophysics	School of Medicine
	Biosciences	Physical Medicine & Rehabilitation	School of Medicine
	Biosciences	Pharmacology	School of Medicine
	Biosciences	Pediatrics	School of Medicine
	Biosciences	Pathology	School of Medicine
	Biosciences	Otolaryngology	School of Medicine
	Biosciences	Orthopedic Surgery	School of Medicine
	Biosciences	Ophthalmology	School of Medicine
	Biosciences	Obstetrics and Gynecology	School of Medicine
	Biosciences	Neurology	School of Medicine
	Biosciences	Neurological Surgery	School of Medicine
	Biosciences	Neurobiology and behavior	School of Biological Science
	Biosciences	Microbiology and Molecular Genetics	School of Medicine
	Biosciences	Medicine	School of Medicine

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Biosciences	Interdisciplinary Programs	School of Medicine
	Biosciences	Interdisciplinary Programs	School of Biological Sciences
	Biosciences	Institute of Genomics and Bioinformatics	Campus-wide
	Biosciences	Health Policy Research	Campus-wide
	Biosciences	General Research Programs	School of Medicine
	Biosciences	General Research Programs	School of Biological Sciences
	Biosciences	Family Medicine	School of Medicine
	Biosciences	Ecology and Evolutionary Biology	School of Biological Sciences
	Biosciences	Developmental Biology Center	Campus-wide
	Biosciences	Developmental and Cell Biology	School of Biological Sciences
	Biosciences	Dermatology	School of Medicine
	Biosciences	Community and Environmental Medicine	School of Medicine
	Biosciences	Center for Virus Research	Campus-wide
	Biosciences	Center for the Neurobiology of Learning and Memory	Campus-wide
	Biosciences	Cancer Research Institute	Campus-wide
	Biosciences	Brain Aging Institute	Campus-wide
	Biosciences	Biological Chemistry	School of Medicine
	Biosciences	Biochemical Engineering	School of Engineering
	Biosciences	Anesthesiology	School of Medicine
	Biosciences	Anatomy and Neurobiology	School of Medicine
	Biosciences	Molecular Biology and Biochemistry	School of Biological Sciences
	Computers and Semiconductors	Electrical Engineering	School of Engineering
	Computers and Semiconductors	Center for Embedded Computer Systems	Campus-wide
	IT	Institute for Software Research	Campus-wide
	IT	General	Information and Computer Science Department
	IT	Center for Research on Information Technology and Organizations	Campus-wide

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
Los Angeles	Aerospace	Mechanical and Aerospace Engineering	School of Engineering and Applied Science
	Biosciences	Urology	School of Medicine
	Biosciences	Surgery	School of Medicine
	Biosciences	Structural Biology and Genetics	School of Medicine
	Biosciences	Radiology	School of Medicine
	Biosciences	Radiation Oncology	School of Medicine
	Biosciences	Psychiatry and Behavioral Sciences	School of Medicine
	Biosciences	Physiology	School of Medicine
	Biosciences	Pediatrics	School of Medicine
	Biosciences	Pathology and Laboratory Medicine	School of Medicine
	Biosciences	Orthopedic Surgery	School of Medicine
	Biosciences	Ophthalmology	School of Medicine
	Biosciences	Obstetrics and Gynecology	School of Medicine
	Biosciences	Nuclear Medicine	School of Medicine
	Biosciences	Neuropsychiatric Institute	Campus-wide
	Biosciences	Neurology	School of Medicine
	Biosciences	Neurobiology	School of Medicine
	Biosciences	Muscular Dystrophy Research	College of Letters and Science
	Biosciences	Molecular, Cell, and Developmental Biology	College of Letters and Science
	Biosciences	Molecular Biology Institute	College of Letters and Science
	Biosciences	Molecular and Medical Pharmacology	School of Medicine
	Biosciences	Microbiology and Molecular Genetics	College of Letters and Science
	Biosciences	Microbiology and Immunology	School of Medicine
	Biosciences	Medicine	School of Medicine
	Biosciences	Jules Stein Eye Institute	School of Medicine
	Biosciences	Jonsson Comprehensive Cancer Center	School of Medicine
	Biosciences	Jerry Lewis Neuromuscular Research Institute	School of Medicine
	Biosciences	Immunogenetics Center	School of Medicine
	Biosciences	Human Genetics	School of Medicine
	Biosciences	General-Public Health	School of Public Health
	Biosciences	General-Nursing	School of Nursing

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Biosciences	Family Medicine	School of Medicine
	Biosciences	Emergency Medicine	School of Medicine
	Biosciences	Dentistry	School of Dentistry
	Biosciences	Dental Research Institute	School of Dentistry
	Biosciences	Crump Institute	School of Medicine
	Biosciences	Clinical Research Center	School of Medicine
	Biosciences	Chemistry and Biochemistry	College of Letters and Science
	Biosciences	Center for Health Promotion and Disease Prevention	School of Medicine
	Biosciences	Brain Research Institute	School of Medicine
	Biosciences	Biomedical Engineering	School of Engineering and Applied Science
	Biosciences	Biomathematics	School of Medicine
	Biosciences	Biological Chemistry	School of Medicine
	Biosciences	Anesthesiology	School of Medicine
	Biosciences	Biology	College of Letters and Science
	Computers and Semiconductors	Materials Science and Engineering	School of Engineering and Applied Science
	Computers and Semiconductors	Electrical Engineering	School of Engineering and Applied Science
	IT	Computer Science	School of Engineering and Applied Science
	IT	Center for Digital Innovation	Campus-wide
<b>Riverside</b>	Agriculture	Statistics	Agricultural Experiment Station
	Agriculture	Plant Pathology	Agricultural Experiment Station
	Agriculture	Nematology	Agricultural Experiment Station
	Agriculture	Environmental Sciences	Agricultural Experiment Station
	Agriculture	Entomology	Agricultural Experiment Station
	Agriculture	Earth Sciences	Agricultural Experiment Station
	Agriculture	Botany and Plant Science	Agricultural Experiment Station
	Agriculture	Biology	Agricultural Experiment Station

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Agriculture	Biochemistry	Agricultural Experiment Station
	Agriculture	Agricultural Operations	Agricultural Experiment Station
	Biosciences	Neuroscience	College of Natural and Agricultural Sciences
	Biosciences	General-Biomedical	Biomedical UC Riverside/UCLA Program
	Computers and Semiconductors	Electrical Engineering	College of Engineering
	Computers and Semiconductors	Center for Research in Intelligent Systems	College of Engineering
	IT	Computer Science	College of Engineering
<b>San Diego</b>	Aerospace	California Space Institute	Campus-wide
	Aerospace	Astrophysics and Space Science Center	Campus-wide
	Agriculture	Molecular Agriculture Center	Campus-wide
	Biosciences	White Mountain Research	School of Medicine
	Biosciences	Whitaker Biomedical Engineering	Campus-wide
	Biosciences	Surgery	School of Medicine
	Biosciences	Research in Biological Structures	School of Medicine
	Biosciences	Reproductive Medicine	School of Medicine
	Biosciences	Radiology	School of Medicine
	Biosciences	Psychiatry	School of Medicine
	Biosciences	Pharmacy-intercampus	School of Medicine
	Biosciences	Pharmacology	School of Medicine
	Biosciences	Pediatrics	School of Medicine
	Biosciences	Pathology	School of Medicine
	Biosciences	Orthopedics	School of Medicine
	Biosciences	Ophthalmology	School of Medicine
	Biosciences	Office of Learning Resources	School of Medicine
	Biosciences	Neurosciences	School of Medicine
	Biosciences	Neural Computation Institute	Campus-wide
	Biosciences	Molecular Genetics Center	Campus-wide
	Biosciences	Medicine	School of Medicine
	Biosciences	Institute for Research on Aging	School of Medicine
	Biosciences	Gene Therapy Program	School of Medicine

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Biosciences	Family and Preventive Medicine	School of Medicine
	Biosciences	Emergency Medical Program	School of Medicine
	Biosciences	Chemistry-medical	School of Medicine
	Biosciences	Chemistry and Biochemistry	Department of Chemistry and Biochemistry
	Biosciences	Center for Marine Biotechnology and Biomedicine	Scripps Institute of Oceanography
	Biosciences	Cellular and Molecular Medicine	School of Medicine
	Biosciences	Cancer Center	School of Medicine
	Biosciences	Biology-medical	School of Medicine
	Biosciences	Biology	Department of Biology
	Biosciences	Biological Structures Center	Campus-wide
	Biosciences	Bioengineering-medical	School of Medicine
	Biosciences	Bioengineering	Jacobs School of Engineering
	Biosciences	Anesthesiology	School of Medicine
	Biosciences	Academic Geriatric Resource Program	School of Medicine
	Computers and Semiconductors	San Diego Supercomputer Center	Campus-wide
	Computers and Semiconductors	Magnetic Recording Research Center	Campus-wide
	Computers and Semiconductors	Electrical and Computer Engineering	Jacobs School of Engineering
	IT	Research in Computing and the Arts	Campus-wide
	IT	Human Information Processing Center	Campus-wide
	IT	Computer Science and Engineering	Jacobs School of Engineering
	IT/ Telecommunications	Cal Institute for Telecommunications and Information Technology	Jacobs School of Engineering
<b>San Francisco</b>	Biosciences	Urology	School of Medicine
	Biosciences	Surgery	School of Medicine
	Biosciences	Social and Behavioral Science	School of Nursing
	Biosciences	Radiology	School of Medicine
	Biosciences	Radiobiology Laboratory	School of Medicine

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Biosciences	Radiation Oncology	School of Medicine
	Biosciences	Psychiatry	School of Medicine
	Biosciences	Proctor Foundation	Campus-wide
	Biosciences	Physiology	School of Medicine
	Biosciences	Physiological Nursing	School of Nursing
	Biosciences	Pharmacy Department	School of Pharmacy
	Biosciences	Pharmacology	School of Medicine
	Biosciences	Pharmaceutical Chemistry	School of Chemistry
	Biosciences	Pediatrics	School of Medicine
	Biosciences	Pathology	School of Medicine
	Biosciences	Otolaryngology	School of Medicine
	Biosciences	Other	School of Nursing
	Biosciences	Orthopedic Surgery	School of Medicine
	Biosciences	Ophthalmology	School of Medicine
	Biosciences	Obstetrics and Gynecology	School of Medicine
	Biosciences	Neurology	School of Medicine
	Biosciences	Neurological Surgery	School of Medicine
	Biosciences	Microbiology and Immunology	School of Medicine
	Biosciences	Metabolic Unit	School of Medicine
	Biosciences	Mental Health and Community	School of Nursing
	Biosciences	Medicine	School of Medicine
	Biosciences	Medical Education	School of Medicine
	Biosciences	LPNI	Campus-wide
	Biosciences	Laboratory Medicine	School of Medicine
	Biosciences	Institute for Health Policy Studies	School of Medicine
	Biosciences	Institute for Neurodegenerative Disease	School of Medicine
	Biosciences	Hormone Laboratory	School of Medicine
	Biosciences	Hooper Foundation	School of Medicine
	Biosciences	History of Health Science	School of Medicine
	Biosciences	Genetics	School of Medicine
	Biosciences	General Clinical Research-campus	School of Medicine
	Biosciences	General Clinical Research Center-SFGH	School of Medicine
	Biosciences	Family Health Nursing	School of Nursing
	Biosciences	Family and Community Medicine	School of Medicine

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Biosciences	Faculty Fellowships and Special Grants	Campus-wide
	Biosciences	Epidemiology and International Health	School of Medicine
	Biosciences	Dermatology	School of Medicine
	Biosciences	Dentistry	School of Dentistry
	Biosciences	Clinical Pharmacy	School of Pharmacy
	Biosciences	Cardiovascular Institute	School of Medicine
	Biosciences	Cancer Institute	School of Medicine
	Biosciences	Biochemistry and Biophysics	School of Medicine
	Biosciences	Anthropology	School of Medicine
	Biosciences	Anatomy	School of Medicine
	Biosciences	Anesthesia	School of Medicine
<b>Santa Barbara</b>	Biosciences	Neuroscience Research Institute	Campus-wide
	Biosciences	Biological Sciences	College of Letters and Science
	Computers and Semiconductors	Materials Lab	College of Engineering
	Computers and Semiconductors	Materials for Engineering	College of Engineering
	Computers and Semiconductors	Electrical and Computer Engineering	College of Engineering
	IT	Institute for Computational Earth Systems Science	Campus-wide
	IT	General	Office of Information Technology
	IT	Computer Science	College of Engineering
<b>Santa Cruz</b>	Biosciences	Molecular and Cell Development Biology	Division of Natural Sciences
	Biosciences	Ecology and Evolutionary Biology	Division of Natural Sciences
	Biosciences	Biology	Division of Natural Sciences
	Computers and Semiconductors	Computer Engineering	School of Engineering
	IT	Computer Sciences	School of Engineering
<b>San Diego</b>	Aerospace	California Space Institute	Campus-wide
	Aerospace	Astrophysics and Space Science Center	Campus-wide
	Agriculture	Molecular Agriculture Center	Campus-wide
	Biosciences	White Mountain Research	School of Medicine



UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Biosciences	Whitaker Biomedical Engineering	Campus-wide
	Biosciences	Surgery	School of Medicine
	Biosciences	Research in Biological Structures	School of Medicine
	Biosciences	Reproductive Medicine	School of Medicine
	Biosciences	Radiology	School of Medicine
	Biosciences	Psychiatry	School of Medicine
	Biosciences	Pharmacy-intercampus	School of Medicine
	Biosciences	Pharmacology	School of Medicine
	Biosciences	Pediatrics	School of Medicine
	Biosciences	Pathology	School of Medicine
	Biosciences	Orthopedics	School of Medicine
	Biosciences	Ophthalmology	School of Medicine
	Biosciences	Office of Learning Resources	School of Medicine
	Biosciences	Neurosciences	School of Medicine
	Biosciences	Neural Computation Institute	Campus-wide
	Biosciences	Molecular Genetics Center	Campus-wide
	Biosciences	Medicine	School of Medicine
	Biosciences	Institute for Research on Aging	School of Medicine
	Biosciences	Gene Therapy Program	School of Medicine
	Biosciences	Family and Preventive Medicine	School of Medicine
	Biosciences	Emergency Medical Program	School of Medicine
	Biosciences	Chemistry-medical	School of Medicine
	Biosciences	Chemistry and Biochemistry	Department of Chemistry and Biochemistry
	Biosciences	Center for Marine Biotechnology and Biomedicine	Scripps Institute of Oceanography
	Biosciences	Cellular and Molecular Medicine	School of Medicine
	Biosciences	Cancer Center	School of Medicine
	Biosciences	Biology-medical	School of Medicine
	Biosciences	Biology	Department of Biology
	Biosciences	Biological Structures Center	Campus-wide
	Biosciences	Bioengineering-medical	School of Medicine
	Biosciences	Bioengineering	Jacobs School of Engineering

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Biosciences	Anesthesiology	School of Medicine
	Biosciences	Academic Geriatric Resource Program	School of Medicine
	Computers and Semiconductors	San Diego Supercomputer Center	Campus-wide
	Computers and Semiconductors	Magnetic Recording Research Center	Campus-wide
	Computers and Semiconductors	Electrical and Computer Engineering	Jacobs School of Engineering
	IT	Research in Computing and the Arts	Campus-wide
	IT	Human Information Processing Center	Campus-wide
	IT	Computer Science and Engineering	Jacobs School of Engineering
	IT/ Telecommunications	Cal Institute for Telecommunications and Information Technology	Jacobs School of Engineering
<b>San Francisco</b>	Biosciences	Urology	School of Medicine
	Biosciences	Surgery	School of Medicine
	Biosciences	Social and Behavioral Science	School of Nursing
	Biosciences	Radiology	School of Medicine
	Biosciences	Radiobiology Laboratory	School of Medicine
	Biosciences	Radiation Oncology	School of Medicine
	Biosciences	Psychiatry	School of Medicine
	Biosciences	Proctor Foundation	Campus-wide
	Biosciences	Physiology	School of Medicine
	Biosciences	Physiological Nursing	School of Nursing
	Biosciences	Pharmacy Department	School of Pharmacy
	Biosciences	Pharmacology	School of Medicine
	Biosciences	Pharmaceutical Chemistry	School of Chemistry
	Biosciences	Pediatrics	School of Medicine
	Biosciences	Pathology	School of Medicine
	Biosciences	Otolaryngology	School of Medicine
	Biosciences	Other	School of Nursing
	Biosciences	Orthopedic Surgery	School of Medicine
	Biosciences	Ophthalmology	School of Medicine
	Biosciences	Obstetrics and Gynecology	School of Medicine
	Biosciences	Neurology	School of Medicine
	Biosciences	Neurological Surgery	School of Medicine

UC Campus	Cluster Affiliation	Research Unit/Area	Campus Affiliation
	Biosciences	Microbiology and Immunology	School of Medicine
	Biosciences	Metabolic Unit	School of Medicine
	Biosciences	Mental Health and Community	School of Nursing
	Biosciences	Medicine	School of Medicine
	Biosciences	Medical Education	School of Medicine
	Biosciences	LPNI	Campus-wide
	Biosciences	Laboratory Medicine	School of Medicine
	Biosciences	Institute for Health Policy Studies	School of Medicine
	Biosciences	Institute for Neurodegenerative Disease	School of Medicine
	Biosciences	Hormone Laboratory	School of Medicine
	Biosciences	Hooper Foundation	School of Medicine
	Biosciences	History of Health Science	School of Medicine
	Biosciences	Genetics	School of Medicine
	Biosciences	General Clinical Research-campus	School of Medicine
	Biosciences	General Clinical Research Center-SFGH	School of Medicine
	Biosciences	Family Health Nursing	School of Nursing
	Biosciences	Family and Community Medicine	School of Medicine
	Biosciences	Faculty Fellowships and Special Grants	Campus-wide
	Biosciences	Epidemiology and International Health	School of Medicine
	Biosciences	Dermatology	School of Medicine
	Biosciences	Dentistry	School of Dentistry
	Biosciences	Clinical Pharmacy	School of Pharmacy
	Biosciences	Cardiovascular Institute	School of Medicine
	Biosciences	Cancer Institute	School of Medicine
	Biosciences	Biochemistry and Biophysics	School of Medicine
	Biosciences	Anthropology	School of Medicine
	Biosciences	Anatomy	School of Medicine
	Biosciences	Anesthesia	School of Medicine



**VOLUME II.**  
**IMPROVING CALIFORNIA'S HEALTH**





## Volume II. Preface

From food and nutrition to medical innovation and patient care, most Californians' lives are directly affected by the University of California's health contributions every day. The largest health sciences system in the nation, UC has five medical schools and hospitals in Davis, Irvine, Los Angeles, San Diego and San Francisco. The UC system—which teaches more than over 12,000 students annually in health care disciplines—also includes 10 health science schools that train California's nurses, dentists, pharmacists, optometrists, veterinarians and public health professionals. UC provides the most advanced medical care available, translates medical discoveries into new treatments, and also cares for a large portion of the nation's uninsured.

In addition to its medical training and patient care, UC also improves the health of Californians through its basic science and clinical research. UC contributes major medical discoveries and inventions in the diagnosis, prevention and treatment of disease.

A healthy diet and improved nutrition also go hand-in-hand with good health and disease prevention. Toward that goal, UC provides a statewide network of researchers and educators committed to the innovation and application of knowledge in agriculture, natural resources and human health. Through this network, UC makes additional essential contributions to the public's health by improving the production, quality and safety of our food, teaching Californians healthful eating habits and improving the environment we live in.

The education of health professionals, medical research and patient care help fulfill the university's broader, tripartite mission of teaching, research and public service.

Selected examples of UC's health-related activities are described in the following chapters on innovations in the health sciences, teaching California's doctors and nurses, caring for patients, expanding access and community health programs, and UC's contributions in the areas of food, nutrition and agriculture.

### **What's in Volume II**

Chapter 5. Food, Nutrition and Agriculture Impacts

Chapter 6. Health Sciences Innovation

Chapter 7. Training California's Health Professionals

Chapter 8. Caring for Patients

Chapter 9. Expanding Access: UC's Community Health Programs

Health Appendices J-O







## 5. Food, Nutrition and Agriculture Impacts

The University of California, through its Division of Agriculture and Natural Resources (ANR), provides a statewide network of researchers and educators committed to the innovation and application of knowledge in agricultural, natural and human resources. UC plays a key role in improving the quantity and quality of our food and in teaching Californians healthful eating habits—fostering the well-being of Californians and people around the world. UC has provided, and continues to be, a source of many of the world’s improvements in the quality of agricultural products, food safety and nutrition education through research, development and application.

UC ANR research and extension activities can be classified under five broad areas:

- Agricultural productivity and competitiveness
- Food safety and food security
- Nutrition and health
- Conservation and enhancement of natural resources
- Quality of life of families and communities.

UC takes new scientific discoveries from its Agricultural Experiment Station research labs, tests and evaluates them in the field, then adapts and delivers practical applications directly to farmers and consumers through UC’s Cooperative Extension county offices.

ANR activity is conducted through its three primary organizational units: the Agricultural Experiment Station, Cooperative Extension and the Natural Reserve System.

**The Agricultural Experiment Station** is ANR’s research component, consisting of more than 650 scientists who are the primary source of the new research-based knowledge for the division’s various components. Most of the station’s scientists are faculty members who have campus teaching responsibilities in the four colleges and schools affiliated with ANR at the UC Berkeley, Davis and Riverside campuses.

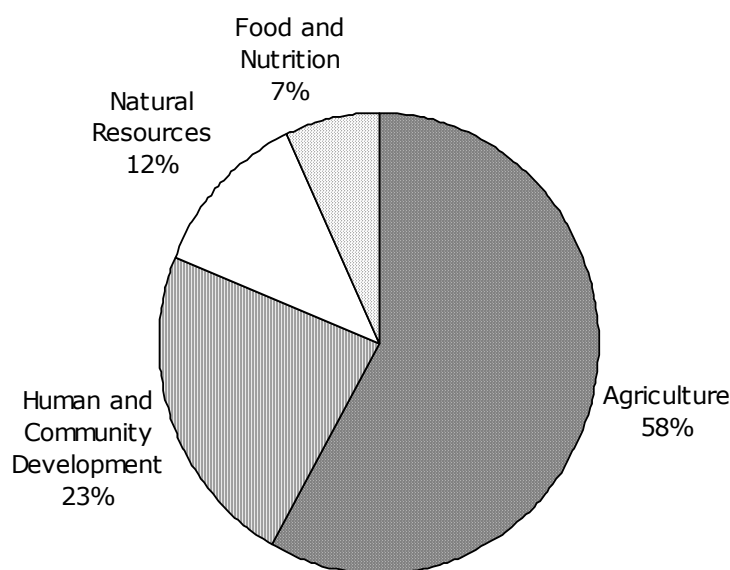
**UC Cooperative Extension** is ANR’s public outreach component, consisting of extension specialists and advisors. UC Cooperative Extension works directly with California’s consumers and producers. The Cooperative Extension specialists are subject-matter experts who also have academic appointments at the Berkeley, Davis and Riverside campuses. Their statewide responsibilities include research and development and education of the public and private stakeholders.

There are also more than 260 Cooperative Extension advisors located in more than 50 county offices throughout the state. The advisors conduct field tests, facilitating the transfer of Cooperative Extension and Agricultural Experiment Station research findings, practices and technologies to users. UC farm advisors, working with growers, processors, government agencies and environmentalists, anticipate and

identify emerging problems in the field. They share this information, which often has substantial economic implications, with specialists and researchers on the Berkeley, Davis and Riverside campuses. Recognizing emerging problems helps set UC research priorities.

In 1998, the county advisors were distributed among the four program areas of agriculture, human and community development, natural resources, and food and nutrition.

**Figure 5-1.**  
**UC Cooperative Extension County Advisors**  
**Full-time Equivalents (FTE) by Program Area, 1998**  
(272 Total FTE)



*Source: The Measure of California Agriculture, 2000, UC Agricultural Issues Center.*

Consisting of 34 parcels of land across the state and encompassing more than 130,000 acres and a variety of California's habitats and ecosystems, UC's **Natural Reserve System** serves both Agricultural Experiment Station and Cooperative Extension programs, as well as other UC units and non-UC agencies and organizations. UC owns about 20% of the land; the remainder is made available through conservation easements and leases or use agreements. The reserves are preserved in their natural state, for observation and study in research and teaching programs.

UC conducts agriculture, nutrition and environmental research in more than 50 departments in the UC Berkeley College of Natural Resources, UC Davis College of Agricultural and Environmental Sciences, UC Davis School of Veterinary Medicine, and UC Riverside College of Natural and Agricultural Sciences.

There are also more than 30 UC research centers and facilities around the state dedicated to improving the production, supply and quality of food and fiber, as well

as the health and safety conditions under which California farmers and their employees operate.

In 2001, UC funding for research and Cooperative Extension totaled approximately \$311 million. The largest source of these funds (55%) came from the state, an indication of UC's importance to California's agriculture industry. Nearly one-quarter (23%) was from federal sources, with 14% from private gifts, grants and contracts and 8% came from other sources such as county governments, endowments, sales and services.

### **Growing California's Agriculture**

California farmers and ranchers produced more than half of the nation's fruits, nuts and vegetables, and generated \$27.2 billion in gross cash receipts in 2000. A major employer and revenue generator in the state, California agriculture accounts for 1.1 million jobs and more than \$60 billion in personal income. California is the nation's leader in agricultural exports, shipping more than \$6.5 billion in food and agricultural products around the world.

California grows more than 350 commodities, including all of the country's almonds, artichokes, Brussels sprouts, dates, dried plums, figs, kiwifruit, nectarines, olives, pistachios and walnuts. Billion-dollar commodities include milk and cream, grapes, nursery products, lettuce, and cattle and calves. Tomatoes, cotton, flowers and foliage, strawberries and hay round out the 10 leading income generators for 2000. (See <http://www.universityofcalifornia.edu/economy/agtop10.html>.)

California has been the nation's number one agricultural state every year since 1948. Eight of the top 10 agricultural counties are in California. (See <http://www.universityofcalifornia.edu/economy/topagcounties.html>.)

### **UC's Role**

California's farmers and ranchers have achieved this steady record of economic growth over the past half-century, while implementing new management and production practices that make their operations the most environmentally compatible and natural resources-conscious in the nation. Much of this economic success can be traced to the impact and influence of the University of California's research and extension programs. (See *Appendix J for a more comprehensive listing of UC's agricultural and natural resource impacts.*)

The close interaction between users in the field, county-based Cooperative Extension advisors and scientists on UC campuses has served California agriculture extremely well. Growers maintain a competitive advantage in national and world markets through early adoption of UC-developed technological advances and have access to new varieties of grapes, strawberries, stone fruits and citrus before the competition.

This network also has led to rapid and widespread dissemination and acceptance of new management practices that influence on-farm production and yields, post-

harvest storage and packaging, reductions in chemical and water use, increased agricultural sustainability and resource conservation, to name but a few. In turn, these innovations have permitted the state's agriculturalists to meet the challenge of producing a safe and healthful food supply while addressing the environmental and resource issues related to agriculture.

UC's agricultural and environmental research achievements have significantly improved Californians' daily life—from the food people eat to the environment they live in—and ultimately resulted in benefits for healthy living. There is a strong relationship between UC's agricultural research and extension programs and improvements in food production, nutrition and the safety and healthfulness of food.

In terms of agricultural production, the university has improved the availability and access to premium UC-patented seed varieties and desirable cultivars and livestock. UC Davis, for example, has a number of services, gene banks and seed incubators that provide advanced plant materials to California nurseries and producers. Notable among them are the C.M. Rick Tomato Genetics Resource Center, Foundation Plant Materials Services, and Foundation Seed and Certification Services.

UC programs and services affect nearly every agricultural commodity grown in California. Beyond California, UC's research and development generate invaluable benefits nationwide. In the areas of production where UC agricultural research is renowned (especially for dairy, fruits and vegetables), California is a leading producer of these commodities nationwide. Some examples include:

- Dairy is California's top commodity. Adoption of UC's research-based practices have improved dairy production through diet, disease prevention and breeding of dairy cows, making California the nation's largest dairy producer (*The Measure of California Agriculture*, 2000). California accounts for nearly 20% of total U.S. milk production. Advanced breeding programs and other genetic improvements have increased milk production in the average cow to 20,500 pounds a year compared to less than 10,000 pounds in 1960. Dairy herds are healthier too, thanks to new vaccines, diagnostic tools, disease prevention, and computerized feed and nutrition programs developed through UC research. In terms of milk production in millions of pounds, California's dairy industry has grown 54% in the 10-year period between 1990 and 2000. (Based on data from annual issues of *California Dairy Industry Statistics*.)
- Milk, yogurt and cheese are arguably the best sources of calcium, which is especially important for growing children, pregnant or breastfeeding women, and senior citizens. In fact, UC researchers found that eating yogurt strengthens the immune system. UC dairy research and technology development, such as the process of using a semipermeable membrane to filter milk to make new products, has contributed to the industry's improvements in dairy quality and nutrient content. These UC contributions have been made by numerous departments, such as animal science, agricultural engineering, agronomy and

range science, food science and technology, agricultural economics, and the school of veterinary medicine.

- California is also one of the nation's top producers of grapes and strawberries. Grapes, strawberries, processed tomatoes, oranges, avocados, peaches, and cantaloupe were among California's leading commodities by cash receipts in 1999. (*The Measure of California Agriculture*, 2000) UC has trained many of the growers and processors of these commodities.

UC agricultural research is also heavily involved in other areas that directly enhance the health and welfare of Californians. As result, UC contributes to the improvements in the diet and nutrients needed for a productive lifestyle.

Consumers benefit in many ways, including improved quality, greater availability and lower prices:

- Improvements in the nutritional quality of agricultural products have reduced food-related illnesses and increased the intake of important vitamins and minerals. According to the U.S. Department of Agriculture, dietary intake of fruits and vegetables is associated with reduced risk of many different diseases, including certain types of cancer. Fruits and vegetables make up the second-largest grouping in the USDA food pyramid guidelines. Between 1980 and 1997, the fresh fruit, tree nut and processed vegetable categories saw the largest percentage increase in per capita consumption in the United States.
- UC agricultural R&D, extension programs and technology transfer have led to increased productivity and yields, contributing to a more abundant food supply and lowered food costs over the past 40 years. As such, increased supply and lower prices have the potential to improve consumers' diets.
- Food safety and security have taken on new meaning in the United States over the past few years. UC scientists and advisors work with people throughout the food system—from farmers to consumers—to prevent food-borne disease. UC veterinarians have shown farmers and ranchers how to prevent accidental and intentional contamination of crops and livestock. UC's county advisors demonstrate proper food-handling procedures for the general public.

### UC Agricultural Research Pays Off

How good an investment is UC's agricultural research? A recent study by the UC Agricultural Issues Center (<http://aic.ucdavis.edu/>) concludes that the average annual internal rate of return for public investment in California agricultural research and extension from 1949 through 1985 was about 20%. During this period, farmers realized a 2.8-fold increase in output with only a 1.6-fold increase in inputs. The difference was attributed to productivity gains resulting from research and development.

The study also provided real-world examples of the role and relationship of UC agricultural production and productivity. Case studies for dairy, grapes and wine, and strawberries demonstrated the very positive economic and environmental

impacts of UC research on these leading commodities. For example, California's \$767 million strawberry industry, which now grows berries nearly year-round, relies on a steady stream of new varieties developed, patented and released by the university.

The state's multi-billion-dollar wine industry also depends on UC research. More than 95% of the wine grapes grown in California come from planting stock that has been certified by UC Davis as virus-free and true to type. Fine wine varieties, including chardonnay, cabernet sauvignon, merlot, zinfandel and sauvignon blanc, now provide winemakers with a reliable supply of high-quality grapes. Many of the state's winemakers and grape growers receive their education and training at UC.

The dairy industry has also benefited from UC research. Advanced breeding programs and other genetic improvements have increased milk production in the average cow to 20,500 pounds a year compared to less than 10,000 pounds in 1960. Dairy herds are healthier, too, thanks to new vaccines, diagnostic tools, disease prevention, and computerized feed and nutrition programs developed through research.

### Contributing to a Healthful Diet

A healthy diet and improved nutrition go hand-in-hand with positive health benefits. In fact, an important part of preventing diseases is the understanding that diet and nutrition influence health. UC's efforts in food processing have improved the food and nutritional quality of common consumption items:

- *Filtration of milk with semipermeable membranes* was pioneered by UC researchers in the 1970s. It has given life to new milk and food products and new multimillion-dollar industries. Filtering with a membrane concentrates milk with no effect to the milk's constituents, taste or color. The process is now used worldwide to make concentrated milks and to collect proteins from whey to make nutritional products. Before this filtration process was invented, much of this cheese byproduct was simply discarded.
- UC nutrition advisors promoted *low-fat milk consumption*. The Hispanic population consumes more whole milk than non-Hispanic populations do. Whole milk has 8 grams of fat in one cup, while 1% milk has 2.5 grams of fat in one cup. Low-fat 1% milk in California has more calcium and protein per cup than whole milk. After UC's 18-week 1% milk campaign, stores reported a 43.8% increase in 1% milk sales.
- *The mechanisms behind zinc's intake and absorption during pregnancy and breast-feeding* were discovered by a UC nutrition specialist. She found that the absorption of zinc—vital to fetal growth and childhood development—rises significantly during breast-feeding, indicating a metabolic adjustment in zinc use to meet the greater need for zinc in milk synthesis. This reveals the need for nursing mothers to ensure they receive adequate zinc.
- *A UC Spanish-language nutrition curriculum* is the first to address the specific food, lifestyle and dietary issues of Mexican-Americans. Using the USDA Food



Guide Pyramid with the bilingual lesson plan, video and poster developed by UC nutrition experts, advisors can suggest ways to reduce fat and added sugar in the traditional Mexican diet. The video has been captioned for the deaf and hard-of-hearing population. The package has been sold to Head Start, public health agencies, schools and adult education programs in numerous states around the country.

### Public Health and Food Safety Contributions

- *Botulism Prevention*: In 1920, a UC bacteriologist developed a heat process to kill the organism that causes botulism, the deadliest form of food poisoning. The discovery led to the modern canning industry.
- *Nitrate Reduction Discovery*: UC research has determined that grapevines need only about half as much fertilizer as commonly applied before. This reduced the risk of nitrate contamination of groundwater.
- *Iodine Program*: UC led the nation in developing a program to ensure that iodine is used in proper amounts in dairy feed and medicine, so that excess iodine in the milk supply is avoided.
- *Screening for Salmonella in Chicken Eggs*: In 1992, UC researchers developed a method to screen chicken eggs for salmonella bacteria, using technology originally developed for chemical and biological weapons detection.
- *E. coli mastitis vaccine* was discovered by scientists at the UC Davis School of Veterinary Medicine and became available to California dairy producers in 1989. By 1993, 300,000 cows had been vaccinated in California. The reduction in clinical mastitis cases reduces the use of antibiotics, resulting in lowered risk of antibiotic residues in meat and milk. (*Valuing UC Agricultural Research and Extension, Summary Report, No. VR-2*)
- *Pasteurization Temperature Breakthrough*: A UC dairy food safety program resulted in the pasteurization temperature being raised one degree (from 160°F to 161°F). Although it may seem like a trivial difference, this was a significant discovery because the single-degree difference was necessary for killing heat-resistant pathogens, such as disease-causing fungi, viruses, bacteria and parasites. The finding led to the worldwide adoption of 161°F as the minimum temperature for pasteurizing raw milk.

### Food Policy Contributions and Education Outreach

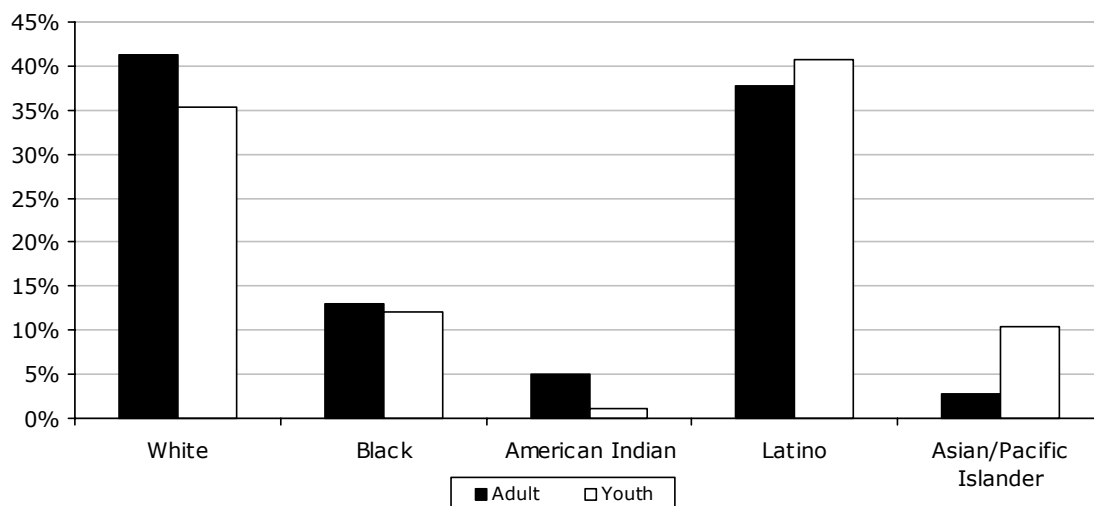
*Food Stamp Nutrition Education Program (FSNEP)* (<http://fsnep.ucdavis.edu/>), headed by UC Davis' nutrition department, seeks to improve the nutrition-related skills of California's food-stamp recipients. UC advisors work directly with recipients to teach them how to buy and cook low-cost nutritional meals for their families. Nutrition education focuses on topics such as self-sufficiency, food budgeting, managing resources, food preparation skills, food safety and sanitation, and feeding infants and children. The program has adult and youth components, which has

generated positive changes in the nutrition-related behavior of the participants. The program has served approximately 80,000 individuals and families in 38 California counties since 1994, with many more reached through community contacts and newsletters. The following figures indicate the program's impact in Federal Fiscal Year (FFY) 2000/01:

- For the Adult FSNEP, 7,688 participants took part in a training program or received home study.
- Another 6,702 adults received a brief nutrition education intervention or demonstration.
- 71,436 individuals received a FSNEP newsletter.

For the Youth FSNEP, 32,936 children received lessons through trained extenders; and 1,102 teachers were recruited to facilitate the program. (California Food Stamp Education Program Final Report for FFY 2000/01, Dec. 10, 2001. FFY 2000/01 extended from Oct. 1, 2000-Sep. 30, 2001.)

**Figure 5-2.**  
**Racial/Ethnic Diversity of FSNEP Program Participants**



Source: Data from FSNEP program director Amy Block Joy and FSNEP Final Report Dec. 10, 2001, FFY 2000/01, UC Davis.

*The UC Davis Food Safe Program* (<http://foodsafety.ucdavis.edu>) enhances knowledge and improves decision-making about food safety among opinion-leaders, food producers, processors, retailers and the public through the development and dissemination of research-based information via its website, workshops, conferences and publications.

*Welfare-Reform Contributions* (<http://danr.ucop.edu/news/July-Dec2002/welfare-reform.html>). A wide variety of UC projects are being conducted systemwide to help California residents comply with new welfare reform laws.

- *UC Cooperative Extension to Study New Food Stamp Card:* UC will be evaluating the implementation of the Electronic Benefits Transfer Card. This is an important study because less than 50% of people in California who qualify for food stamps use them. Some have suggested that the stigma of using the coupons to buy food could be a possible deterrent of its use. The ATM-like card has the potential to minimize or even eliminate the stigma.
- *UC Cooperative Extension Survey for Welfare Reform in Rural Counties:* UC is undertaking a survey to determine why low-income families with pre-school age children in rural Central California do not take advantage of food stamps and low-cost health coverage services. Researchers found that only 49% of eligible rural families receive food stamps; and only 20% of children eligible for low-cost health coverage have it. The survey is part of a 16-state study of welfare reform in rural counties.
- *UC's Building Food Security Workgroup* works with Californians who are malnourished. This effort to improve food security involves collaboration between UC experts in various fields, public agencies and community organizations.

### Farm Labor Occupational Health and Safety

UC health contributions are not just limited to what Californians consume, but extend to the health of those who produce our food. Agriculture ranks among the most hazardous industries, according to the Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health. The U.S. Bureau of Labor Statistics reports that there were 720 work-related deaths in U.S. agriculture in 2000. In California, more than 57,000 agriculture-related illnesses and injuries occurred in 2000, many involving acute trauma. (California Department of Industrial Relations, Division of Labor Statistics and Research, 2000 incidence rates of nonfatal occupational injuries and illnesses)

Farm workers are at high risk for work-related injuries and illnesses, including back injuries, lung diseases, noise-induced hearing loss, skin diseases, arthritis and certain cancers linked with carcinogenic industrial chemicals and pesticides. Farming is one of the few industries in which the health risks are not confined to the individual, but can affect entire families since many live and work near or on the job site.

California has approximately 549,265 hired farm laborers, according to 1997 data. About 58% worked in the Central Valley, mainly in the San Joaquin Valley area. The majority of them are foreign-born males, and 4 out of 5 are Latino. It is a largely young workforce, with nearly half classified as undocumented. Approximately 60% have their families with them in the United States. The California agricultural labor market is also characterized by low earnings, which are the result of relatively low hourly wages and inconsistent employment. (*The Measure of California Agriculture 2000*, UC Agricultural Issues Center)

These characteristics indicate that the farm-laborer demographic is largely located in rural areas where availability to health care is relatively limited. In San Joaquin

County, for example, there are only 10 hospitals, none of which is licensed at the highest “comprehensive” emergency medical services (EMS) level. Lower wages and lack of employer-based health insurance further compound the problem of health care access. Since a significant number of farm workers and their families are undocumented, many cannot benefit from conventional health payment plans or state/county indigent health programs. As a result, the lack of health care access combined with a high-risk occupation and a living environment with significant health hazards puts many of California’s farm laborers and their families at a health disadvantage relative to the rest of California.

UC has long recognized the importance of farm labor health and safety for agricultural productivity and the farm worker community’s quality of life. It is also aware that the government under-funds farm safety. As a response, a number of UC programs and services address these issues and reach out to these communities. UC Davis’ Agriculture Health and Safety Center is a leader of such efforts in California and throughout the western United States.

The following are a small representation of UC’s far-reaching efforts:

*The UC Davis Western Center for Agriculture Health and Safety* was established through a cooperative agreement with the National Institute for Occupational Safety and Health. It is one of 10 U.S. agricultural health and safety centers established to protect and improve the health and safety of the nation’s farmers, farm workers, and consumers through research, outreach/intervention, and industrial hygiene/safety best practice developments. The UC center is the only one in California, and services the far west region of the country. It brings together experts from UC Davis’ agriculture and environmental sciences, medical school, and veterinary school who research the health and safety problems in Western agriculture.

The UC center has helped improve farm worker conditions by leveraging resources needed to address the issues, focusing the attention of state and national agencies toward improving the problems, and reaching out to the farm community. Current research and outreach efforts include: health promotion and disease prevention; injury and ergonomics; neurotoxicity and pesticides; respiratory diseases; industrial hygiene and exposure assessment; evaluation and biostatistics. There are currently 24 projects in these various areas, including:

- *Extending Pesticide Use—Best Practices Information to Ethnic Minority and Limited Resource Specialty Crop Growers:* This study will develop culturally appropriate pesticide management and safety information for small-scale specialty crop producers and targeted minority groups, specifically Latino and Southeast Asian producers. It will test the appropriateness and effectiveness of the pesticide management programs.
- *Study of Pregnancy Outcome:* This study will research the effects of agricultural work on reproductive outcomes to test the hypothesis that the worsening birth outcomes among Latino women are connected with agricultural work. Specifically, it will focus on the adverse effects of agricultural work in relation to

pre-term low birth weight. The study will examine the effects of occupational exposure and other risk factors on pre-term low birth weight in a group of Latino women in the Stockton area.

- **Farm Safety 4 Just Kids:** This project will increase the awareness among agricultural communities of serious farm hazards to children by helping participants practice safety measures that will reduce children's risks of injury or death. The Western Center for Agricultural Health and Safety works with the national Farm Safety 4 Just Kids organization to coordinate the development of community-based programs for farm children and their parents.

*The UC Davis Agricultural Ergonomics Research Center* studies and applies ergonomic approaches to the design and evaluation of farming equipment and work practices that prevent musculoskeletal disorders in agricultural work. Research principals include faculty from the UC Davis, Berkeley and San Francisco campuses, primarily in the area of agricultural engineering. According to the center, a 10-year analysis of injury data in California's agriculture shows that 43% of all reported non-fatal disabling injuries were sprains and strains, of which 40% were back injuries. The cases, as well as the numerous studies, indicate that agricultural work involves risk factors associated with musculoskeletal disorders. Using proper ergonomic principles can prevent many of these risk factors.

The center has produced information and technology that have made positive contributions to farm labor health and safety:

*Grape Collecting and Moving Machine in Vineyards for Harvest:* As part of the Wine Grape Harvest Project, UC has studied vineyard tasks for the past four years, noting that hand harvesting is the most physically demanding job in wine grape vineyard work. It is associated with a high-risk for back injuries. This strain is primarily caused by stooping, gripping, lifting, carrying and dumping fruit up to 20 times per hour. UC's findings led researchers to develop technology and procedures that decrease the persistent pain experienced by many grape harvesters. The harvester is a tractor-mounted piece of equipment that picks up loaded grape bins from the vineyard rows, relieving workers of the task of lifting and carrying bins that weigh as much as 65 pounds. In 2001, the prototype was field tested in Napa and Sonoma counties in collaboration with several wine grape growers, yielding promising results. The project was funded by the National Institute for Occupational Safety and Health.



## 6. Health Sciences Innovation

### Basic Sciences and Clinical Research

In the economic growth chapters, we analyzed the impacts of UC technology transfer and workforce training in the biosciences, including estimates of the dynamic contributions that these UC research expenditures make to productivity, output and employment growth in California. Yet beyond these economic impacts, UC's basic scientific and clinical research also helps to lay the foundation for patient care provided in UC and non-UC hospitals and medical facilities throughout the state—giving Californians valuable access to new treatments and technologies.

UC has more than 230 specialized biosciences research centers and institutes at its nine existing campuses. More than 150 of the biosciences research centers are part of or affiliated with UC health sciences programs. Many of these centers have been designated as national centers by prominent national health organizations—a distinction conferred on only a very select group of centers nationwide. For example, the American Heart Association named UC San Diego School of Medicine as one of six Bugher Centers for Cardiovascular Molecular Biology in 1991. The Davis, Irvine, Los Angeles and San Diego campuses have four of California's six nationally recognized Alzheimer's Disease Research Centers. Many of these research centers provide patient care, as will be discussed in Chapter 8.

- In FY 2000, California's health sciences research institutions received \$2,248,309,000 in NIH funding, making California the largest National Institutes of Health (NIH) grantee state in the U.S. ***Of this amount, UC health sciences system accounted for nearly \$900 million, or approximately 40% of total NIH funding to California institutions.*** All five UC medical centers are among the top10 NIH grantee campuses in California, with UC San Francisco and UCLA ranked 1st and 2nd, respectively.<sup>8</sup>
- ***UC medical schools receive more NIH funding than any other medical educational system in the United States.*** In FY 2000, UC medical schools secured a total of \$658,681,344 in NIH research funding.
- UC received more NIH research funding for its medical schools than any other institution in the United States, and more than the next two largest recipients combined. On a per campus basis, two UC medical schools are among the top 10 U.S. medical schools in terms of the highest amount of NIH funding: UC San Francisco and UCLA Schools of Medicine ranked 4th and 7th in the nation, respectively.

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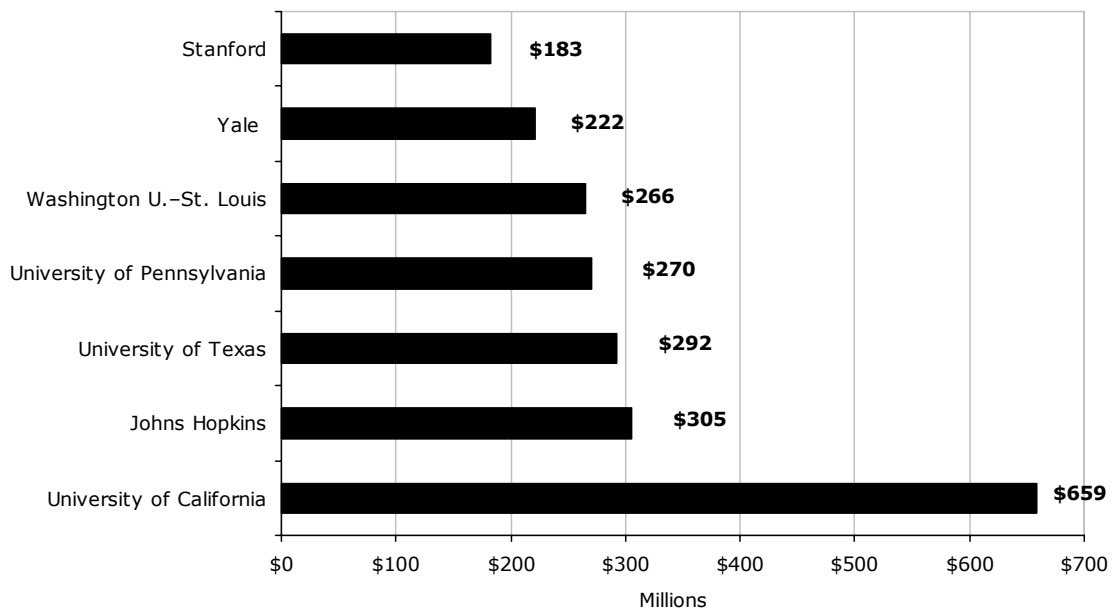
<sup>8</sup> UCOP Clinical Services Department, "University of California Academic Medical Centers: Fulfilling Critical Missions In An Increasingly Challenging Environment," 2002 (abbreviated UCOP 2002 AMC Report); derived from NIH Award data.

**Figure 6-1.**  
**NIH Support to UC Medical Schools, FY 2000**

<b>UC Schools of Medicine</b>	<b>NIH Funding, FY 2000</b>
Davis	\$39,633,967
Irvine	\$42,882,366
Los Angeles	\$182,623,306
San Diego	\$143,001,002
San Francisco	\$250,540,703

Source: NIH Support of U.S. Medical Schools, FY 2000 at <http://silk.nih.gov/public/cbz2zoz.@www.med.total.fy2000.dsncc>

**Figure 6-2.**  
**NIH Support to Selected U.S. Medical Schools, FY 2000**



Source: NIH

- In FY1997-98, UC attracted a combined total of \$481,357,272 in NIH medical contracts and grant activities and \$781,617,703 in non-NIH medical contracts and grant activities. (Medical awards do not include allied health fields such as nursing, pharmacy, and optometry, according to the UC Office of the President) UC San Francisco received the largest amount of funds in both categories, accounting for 38% of the NIH funding and 40% of the non-NIH funding.



- UC San Diego School of Medicine ranks 2nd in the country among all medical schools in research funding per faculty member. In FY 2001, UCSD received \$207 million in NIH research dollars.
- All four UC San Francisco health sciences schools (medicine, dentistry, nursing, pharmacy) ranked among the top four comparable institutions in the country in terms of FY 2000 NIH research dollars. UCSF received a total of \$295.3 million in research grants, training grants, contracts and fellowships during the 2000 federal fiscal year. Annually, UCSF health scientists receive around 2,300 research awards and grants.

## Clinical Research Trials

Clinical research takes basic scientific innovations to the next level—and closer to benefiting individual patients. UC's five medical centers conduct thousands of clinical research projects that test the safety and effectiveness of devices, medications and treatments. These trials make new drugs, devices, therapies and surgical procedures available to participants before they are widely available to the general public and often represent an avenue for patients to receive promising new therapies that would not otherwise be available. In some cases, these clinical trials can be lifesaving.

One type of clinical research project is the clinical research trial, carefully controlled studies using human subjects and designed to test the safety and effectiveness of devices, medications, and treatments as part of the U.S. Food and Drug Administration approval process. UC trials usually have extramural support of some type such as NIH or private-sector (i.e., pharmaceutical or device sector) sponsorship. The principal investigators for clinical research trials are typically practicing faculty physicians who need access to patients for the trials.

Nationally, UC campuses are renowned for the volume and scope of their clinical research activity. Since each UC medical center gathers and records its data on research activity in different ways, it is difficult to aggregate an exact cumulative figure for all five centers.

Active protocols<sup>9</sup> at UC are listed below (where possible, the numbers are disaggregated by source of funding):

- UC Davis currently has 1,550 ongoing clinical research projects (including active exempt protocols<sup>10</sup>).

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9 Consists of currently active Institutional Review Board (IRB) approvals.

10 Exempt protocols are clinical research projects that are not reviewed by the full IRB committee because they do not involve human subjects. To be exempt, the trial has to fall into one or more of the following categories: 1) research in an educational setting on educational matters (i.e., teaching strategies); 2) research using surveys, interviews, educational tests, or observations of public behavior, unless the information generated identifies the human subject; 3) research involving the use of existing data that is publicly available or recorded in a manner that does not identify the human subject. If exempt protocols are included, the activity is termed "clinical research projects" to account for clinical trials and non-trial clinical research; if exempt protocols are excluded the activity is termed "clinical research trials."

- UC Irvine has approximately 807 active clinical research trials (excluding active exempt protocols). These trials consist of 173 NIH-supported and 139 industry-supported trials. The other 511 trials have extramural support of some type.
- UCLA has more than 3,100 approved projects at any given time. There are approximately 1,700 clinical trials, as defined by requiring full IRB review of biomedical procedures using a drug, device or biologic.
- UC San Diego has 1,922 currently active clinical research projects (including active exempt protocols). Of these, 622 are NIH-sponsored and 326 are industry-supported. The remaining 1,375 trials have other types of extramural support. Of the commercially sponsored trials, more than 20 are sponsored by San Diego-based biotech firms and 70 by California companies.
- UCSF has a total of 833 active clinical research trials<sup>11</sup> (excluding active exempt protocols). The funding breakdown<sup>12</sup> is as follows: 379 industry funded, 369 federally funded,<sup>13</sup> 51 other private funded (non-profit), 12 other government funded (state, county, city), 17 UCSF/UC system funded, and 55 funded by other (not identified) sources.

Many patients from California are involved in UC's clinical research projects. For some patients, clinical trials represent an avenue for receiving promising new therapies that would not otherwise be available. Patients with difficult-to-treat or currently "incurable" diseases often pursue participation in clinical trials if standard therapies are not effective. Some examples of clinical trials currently underway at UC medical centers include:

**Bionic Ear.** An estimated 460,000 to 740,000 people in the United States have severe or profound hearing loss. According to the California Department of Health Services, the California Newborn Hearing Screening Program is expected to identify 1,200 infants in California with hearing loss each year. A team of clinical specialists at UC San Francisco is studying the potential of the "Bionic Ear" cochlear implant for adults with severe or profound hearing loss. The Clarion CII Bionic Ear cochlear implant device was developed by a private firm (Advanced Bionics) and approved by the U.S. Food and Drug Administration. The UCSF clinical study is expected to provide new high-resolution audio programming strategies for patients who use the Bionic Ear, which may also benefit those who are unable to hear with current digital hearing aids.

**Diabetes Prevention.** UCLA researchers are working on a Diabetes Prevention Clinical Trial. Researchers hope to learn if avoiding intact cow milk proteins in the first six to eight months of a newborn's life can decrease the incidence of type I diabetes by age 10 in genetically at-risk babies (insulin dependent diabetes—type 1—present in one of the baby's immediate family members). In the trial being

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<sup>11</sup> This definition does not include behavioral studies. Note: There may be a discrepancy in the figure because UCSF recently moved to a new database that may be providing incomplete data.

<sup>12</sup> The numbers do not add up because there can be more than one source of funding for some trials.

<sup>13</sup> UCSF's Institutional Review Board (IRB) could not report on NIH specifically.

sponsored by the National Institutes of Health, 2,800 subjects will be enrolled over a period of two to three years and will then be followed for a period of 10 years. This is a very important study, especially for Californians. As of now, diabetes is a chronic disease with no cure.

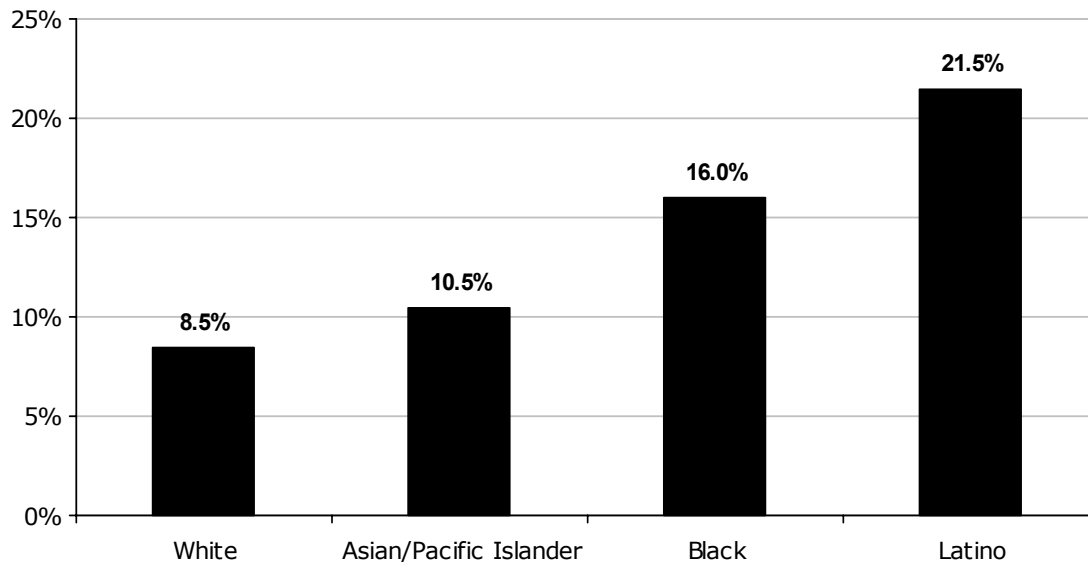
The following figures from the American Diabetes Association suggests that a significant proportion of the population is affected by diabetes:

- Approximately 17 million people, or 6.2% of the U.S. population, have diabetes: 11.1 million of these have been diagnosed, while 5.9 million are unaware of their condition.
- Each day approximately 2,700 people are diagnosed with diabetes. It is expected that one million people over the age of 20 years will be diagnosed this year.
- Diabetes is the fifth deadliest disease in the United States, contributing to nearly 210,000 deaths in 1999.
- Some groups have a higher risk of developing diabetes than others. Diabetes is more common in African Americans, Latinos, Native Americans, Asian Americans, and Pacific Islanders.
- Two million, or 10.2%, of Mexican Americans have diabetes, with a higher distribution of incidences in California and Texas with relatively larger Mexican-American populations.
- The Centers for Disease Control and Prevention estimates 1,456,000 Californians have diabetes. Half of these are undiagnosed. The American Diabetes Association places the numbers higher at 2.2 million Californians, with more than a million undiagnosed.

**Approximately 1 out of 22 Californians  
is afflicted with diabetes.**

**The California Department of Health Services  
estimates that diabetes costs the state  
more than \$12 billion  
in medical care and lost productivity.**

**Figure 6-3.**  
**Prevalence of Diabetes Among California Women Over Age 55**



*Source: Latino Issues Forum; Behavioral Risk Factor Survey, 1984-1993, California Department of Health Services, Diabetes Control Program, 1995.*

**New Pacemaker-like Device to Treat Heart Failure.** UC San Francisco researchers are participating in nationwide clinical trials to test an implant device that may be effective in relieving the symptoms of heart failure. UCSF is one of 80 medical centers across the United States involved in the study. In 1996, UCSF physicians were the first in the United States to implant a pacemaker-like device. A nationwide leader in research and development of implant technology to treat heart failure, UCSF's efforts in this area are profound, because heart conditions afflict a large segment of the population with multiple diseases:<sup>14</sup>

- Heart failure occurs in people who may have survived a heart attack or who have other medical conditions like hypertension, diabetes, malfunctioning heart valves, alcoholism, and viruses, which damage the heart muscle.
- Progressive cardiovascular disease and advanced heart failure affects more than 5 million Americans, some of whom are suitable candidates for heart transplantation but cannot receive one due to the lack of available organs.
- Nearly 60 million Americans—one out of every five adults—have some form of cardiovascular disease, including congestive heart failure, coronary heart disease and high blood pressure.

<sup>14</sup> UCSF Clinical and Research Information; UC Davis Department of Internal Medicine, Division of Cardiovascular Medicine.

- In 1996, more than 84,000 Californians died from cardiovascular diseases—accounting for 38% of all in-state deaths that year.

**UC estimates that cardiovascular disease costs California over \$15 billion in medical and lost productivity costs—\$500 per Californian.**

## UC Innovations

UC basic health science and clinical research have advanced disease prevention and treatment. Many medical devices and drugs that have improved health and treated some of the most complex medical conditions can be traced back to pioneering research of UC scientists and clinical practitioners. The following examples of UC discoveries and UC-developed health technologies have had a significant impact on medicine.

### ***Diagnosis/Detection Innovations***

- A UC scientist in 1950 created the rectilinear scintillation scanner to locate tumors and to study liver, kidney and lung function.
- In 1964, a UC doctor invented a tissue typing technique, which is now the standard test for all patients before receiving a tissue or organ transplant.
- A UC scientist developed a blood test to detect the genetic defect that causes the Tay-Sachs disease. The test, created in 1969, led to prenatal tests and parental screening.
- In 1974, UC epidemiologists determined that the *Chlamydia trachomatis* organism causes pneumonia and lung damage in newborns.
- Positron Emission Tomography (PET) scan, which visualizes metabolic changes in the brain and body, was invented by UC scientists in 1974.
- In 1975, UC doctors developed a device that determines when brain death occurs.
- UC scientists developed prenatal tests for sickle cell anemia and thalassemia blood-related disorders in 1976.
- UC scientists isolated the gene for insulin in 1977, which led to the mass production of genetically engineered insulin to treat diabetes.
- In 1982, UC optometrists developed an eye test that detects diabetics' inability to see blue. If detected in the early stages, patients can receive treatment to prevent severe vision loss.
- The gene markers for Down's syndrome (1987) and Huntington's disease (1989) were discovered by UC scientists.

- UC physicians reported the nation's first cases of acquired immunodeficiency syndrome (AIDS) in 1981.
- UC scientists were among the first three groups in the world to isolate the human immunodeficiency virus (HIV) in 1983.
- A computerized map of blood vessels feeding the heart was developed by UCI scientists in 1984. Its applications provide minimally—invasive, image-guided vascular and non-vascular surgery, offering a more cost-effective health care alternative to some surgical therapies.
- The XMR suite, the first suite in the world to combine an MRI with a complete diagnostic and interventional angiography catheter X-Ray lab (XMR suite), has been developed at UC San Francisco in partnership with Philips Medical Systems. The XMR suite already has demonstrated improved treatment capability for patients with complex vascular disease.
- The prostate cancer metastases tracking system was developed in 2002 by UC researchers who have demonstrated for the first time that they can locate difficult-to-detect prostate cancer metastases in laboratory models. The discovery could lead to safer and more effective gene-based treatments.

### ***Prevention Innovations***

- Vitamins E, K, and a potent form of vitamin D were discovered by UC San Francisco scientists in 1922, 1935, and 1967 respectively. Vitamin E is needed to protect against damage to DNA; vitamin K is necessary for proper blood-clotting; and vitamin D is critical to metabolism. Today, these vitamins are commonly added to fortified food products and recommended as dietary supplements for those with deficiencies.
- The hepatitis B vaccine was developed by UC San Francisco scientists in 1981. 2002 marked the 20th anniversary of the implementation in the United States of the world's first vaccine against the hepatitis B virus. The vaccine has provided a safe and effective way to prevent this chronic infection and disease. Before 1982, an estimated 200,000-300,000 persons in the U.S. were infected annually with hepatitis, including some 20,000 children. During 1982-2002, an estimated 40 million infants and children and 30 million adults received the hepatitis B vaccine. Because of the vaccine, the number of persons infected in the U.S. declined to an estimated 79,000 in 2001, according to the Centers for Disease Control and Prevention.
- Folic acid/vitamin B12 combination was shown by UC researchers to be a cost-effective way to treat and prevent heart disease.

### ***Treatment Innovations***

- UC scientists created a device that removes blood clots from arteries and veins as an alternative to costly open-heart surgery for patients.

- UC researchers developed a procedure to maintain organs for transplant for up to 72 hours.
- Herceptin, developed at UC, was the first cancer drug to treat a specific genetic alteration.
- Doctors at UC Irvine performed the world's first infant heart-lung bypass in 1977.
- The gene for human growth hormone was cloned by UC San Francisco scientists in 1979, leading to a genetically engineered human growth hormone.
- UC scientists in 1980 patented an artificial lung surfactant, dramatically improving treatment for premature infants.
- UC scientists pioneered Retroperfusion, a technique that uses a pump to oxygenate blood and restore damaged heart muscle immediately after a heart attack. (1981)
- In 1984, UC San Francisco urologists developed the first bladder pacemaker to restore urinary control for quadriplegics and paraplegics.
- UC scientists isolated the First Human Blood Cell Growth Factor, paving the way for treatments that reduced hospitalization time for cancer patients undergoing bone marrow transplantation from 30 to nine days (1985).
- The nicotine patch was developed by UCLA researchers in 1991.
- An inner ear implant device was developed in 1991 by UC researchers.
- In 2001, researchers at UC Irvine developed a non-contact ultrasonic burn care device that replaces conventional physical examination of the burn site with a more precise and less painful computer-based examination.
- A brain tumor vaccine that completely eliminates brain tumors in laboratory rats was developed in 1996 by UC researchers.

**Figure 6-4.  
UC Innovations Timeline**

<b>Diagnosis/Detection Innovations</b>	
<b>1950:</b>	rectilinear scintillation scanner created
<b>1964:</b>	tissue typing technique invented
<b>1969:</b>	blood test to detect Tay-Sachs disease developed
<b>1974:</b>	Chlamydia trachomatis determined to cause newborn pneumonia and lung damage
<b>1974:</b>	Positron Emission Tomography (PET) scan invented
<b>1975:</b>	device to determine brain death developed
<b>1976:</b>	prenatal tests for sickle cell anemia and thalassemia blood-related disorders developed
<b>1977:</b>	insulin gene isolated
<b>1981:</b>	first cases of AIDS reported
<b>1982:</b>	eye test to prevent severe vision loss in diabetics developed
<b>1983:</b>	among first three groups worldwide to isolate HIV
<b>1984:</b>	computerized map of blood vessels feeding heart developed
<b>1987:</b>	gene marker for Down's syndrome discovered
<b>1989:</b>	gene marker for Huntington's disease discovered
<b>2002:</b>	prostate cancer metastases tracking system developed
<b>Prevention Innovations</b>	
<b>1922:</b>	vitamin E discovered
<b>1935:</b>	vitamin K discovered
<b>1967:</b>	potent form of vitamin D discovered
<b>1981:</b>	hepatitis B vaccine developed
<b>Treatment Innovations</b>	
<b>1967:</b>	procedure to maintain organs for transplant for up to 72 hours developed
<b>1977:</b>	world's first infant heart-lung bypass performed
<b>1979:</b>	human growth hormone gene cloned
<b>1980:</b>	artificial lung surfactant patented
<b>1981:</b>	retroperfusion technique pioneered
<b>1984:</b>	first bladder pacemaker developed
<b>1985:</b>	first human blood cell growth factor isolated
<b>1991:</b>	nicotine patch developed
<b>1991:</b>	inner ear implant device developed
<b>1996:</b>	brain tumor vaccine developed
<b>2001:</b>	non-contact ultrasonic burn care device developed



## 7. Training California's Health Professionals

California's health care system depends on the supply of qualified personnel, particularly the physicians and nurses who staff medical facilities and deliver essential patient care services throughout the state. The University of California is the largest single producer of trained physicians in the United States. UC's role in training California's physician workforce will continue to be crucial in the coming years, as California is growing faster than it is training doctors. For the state to provide quality care, California needs to sustain an adequate physician-patient ratio.

Operating the largest health sciences education and training program in the nation, UC has more than 12,000 students enrolled in medicine, nursing, pharmacy, optometry, public health, and other health professional schools (UCOP AMC Report). More than two-thirds of all medical students in California are enrolled in UC medical schools and nearly half of all residents in the state are trained in UC-based and UC-affiliated programs. UC also provides one of the best clinical infrastructures for training students and residents.

This chapter focuses on a selection of UC's education and training programs and its contribution to the state's health workforce.

### California's Physician Workforce

In 2000, California had 89,507<sup>15</sup> active allopathic (M.D.) and osteopathic (D.O.) physicians. This figure amounted to 190 physicians per 100,000 persons in 2000, slightly lower than the U.S. average proportion (estimated at 195-200 per 100,000). According to the Council on Graduate Medical Education, adequate physician supply is 145-185 patient-care physicians per 100,000.<sup>16</sup>

Historically, physician supply has been growing at a slightly faster rate than California's population. Between 1994 and 2000, there was a 7% net per capita growth in physicians—from 177 to 190 per 100,000. The National Center for Health Workforce Information Analysis projects a 27.1% increase in the number of California physicians between 1996 and 2006, compared to 19.0% nationally. California will have approximately 1,700 physicians added to California's workforce on average annually,<sup>17</sup> for an estimated 6,800 new physicians between 2002 and 2006.

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15 Unless otherwise stated, data from California Workforce Initiative, "The Practice of Medicine in California: A Profile of the Physician Workforce." February 2001 AMA. This number includes medical residents since residents are licensed as M.D. or D.O. They numbered 10,070, or approximately 11.2% of total licensed physicians.

16 Of note, there are criticisms of COGME recommendations, but these numbers tend to be generally accepted by most healthcare workforce planners.

17 Based on the number of physicians in 1998 (63, 572) and an average annualized growth rate of 2.71% between 1996 and 2000.

# UC Contributions to Medical Education and Training in California

## *Medical School Education*

According to the *Special Report on Medical Student Diversity* (Medical Student Diversity Task Force, November 2000), California medical student education is conducted in eight allopathic medical schools (granting the Doctor of Medicine, or M.D., degree) and in two allopathic medical schools (granting the Doctor of Osteopathy, or D.O., degree). Among the state's allopathic schools are the five public schools located on the UC Davis, Irvine, Los Angeles, San Diego and San Francisco campuses and three private medical schools based at Loma Linda University, Stanford University and the University of Southern California. Osteopathic medical education is provided by the College of Osteopathic Medicine of the Pacific (in southern California) and the recently opened Touro University College of Osteopathic Medicine in Vallejo. (Unless otherwise stated, the aggregate medical education figures consist of combined allopathic and osteopathic medical school data.)

Approximately 5,300 students are enrolled in the 10 medical schools annually, a majority of whom are California residents. Each year, approximately 1,300 students enter their first year at allopathic and osteopathic medical schools. First-year class enrollments in California allopathic medical schools have remained fairly constant since 1987 with total first-year enrollments at approximately 1,050.<sup>18</sup> UC medical schools have remained at a relatively constant level with 629 new students admitted each year.<sup>19</sup> In the same period, this level has fluctuated slightly at private California medical schools, from a low of 342 to a high of 420.

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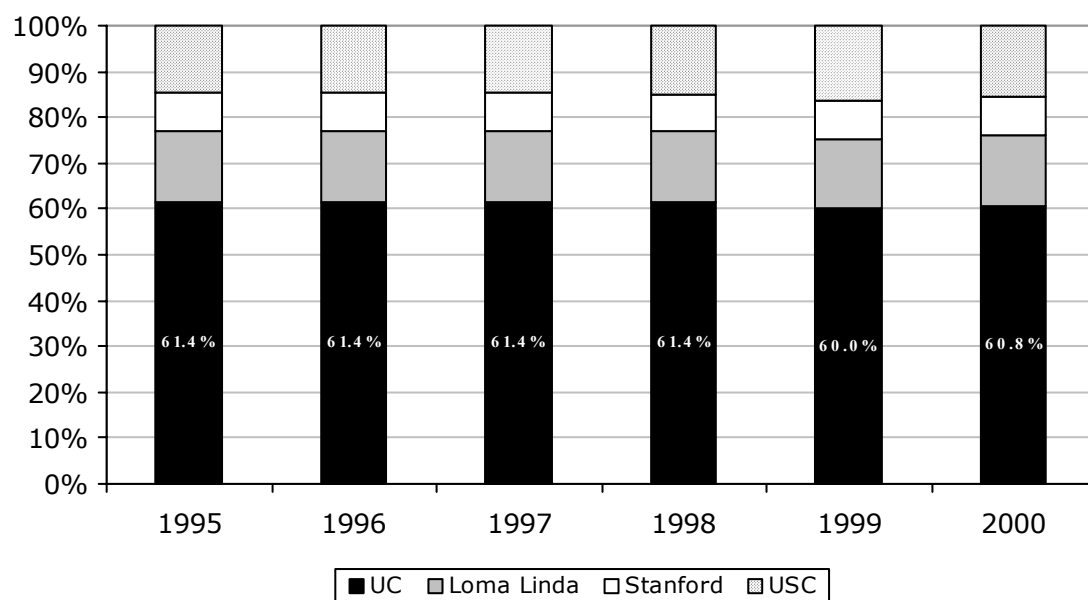
<sup>18</sup> Derived from Bureau of Health Professions, National Center for Health Workforce Information Analysis data.

<sup>19</sup> California Medical Student Diversity Task Force, Special Report on Medical Education Diversity, November 2000. Appendix D: Enrollment Data. UC figures include numbers from Drew University.

**Figure 7-1.**  
**First-Year Class Enrollment Levels at California Medical Schools, 1995-2000**

	1995	1996	1997	1998	1999	2000
Davis	93	93	93	93	93	93
Irvine	92	92	91	92	92	92
Los Angeles	169	169	169	169	169	169
San Diego	122	122	122	122	122	122
San Francisco	153	153	153	153	153	153
<b>UC Total</b>	<b>629</b>	<b>629</b>	<b>629</b>	<b>629</b>	<b>629</b>	<b>629</b>
Loma Linda	159	159	158	158	160	159
Stanford	86	86	86	86	86	86
USC	150	150	150	152	174	161
<b>California Total</b>	<b>1,024</b>	<b>1,024</b>	<b>1,022</b>	<b>1,025</b>	<b>1,049</b>	<b>1,035</b>

**Figure 7-2.**  
**California Medical Schools' Share of the State's First-Year Class Enrollments, 1995-2000**



*Note: UC figures include numbers from Drew University.*  
*Source: California Medical Student Diversity Task Force, Special Report on Medical Education Diversity, November 2000. Appendix D: Enrollment Data.*

***UC accounts for nearly 60% of the allopathic medical students enrolled in California every year. UC medical schools are graduating more medical doctors than any other institution in California.***

The following points summarize the importance of UC's contribution to medical education in California:

UC represents California's largest capacity for physician training. This is especially significant for a state that is growing faster than it is training doctors and that lags behind other states in terms of medical education capacity per 100,000. California cannot accommodate the majority of applicants to its medical schools, even if they are well-qualified and have a first preference for studying in the state. Clearly, it is important that UC be able to maintain the same levels of enrollment.

UC medical schools have low educational fees when compared to private schools and out of state public institutions and most UC students have less educational fee debt on average than medical students in the nation. This is especially important, as many are partially discouraged to pursue medicine because of the increasing level of indebtedness. Nonetheless, the relatively higher cost of living in California makes the overall expense higher for medical students in the state. This has implications on UC's ability to sustain and increase financial aid levels.

### ***The Next Step in Medical Education: Residency Training***

Following medical school graduation, a physician begins residency training in a specialty, which averages three to six years depending on the type of specialty and institutional requirements of individual programs. Approximately 30% of the residents complete two to three additional years of subspecialty training.<sup>20</sup> Residency training trends are typically a better indicator of physician workforce impact for the state for the following reasons:

- Residents are in the last phase of their medical education and training, thus closer to entry into practice.
- Roughly 70% of physicians in California residency programs remain in the state to practice. Therefore, location of residency training is an important predictor of practice location.<sup>21</sup>
- The aggregate levels of residents and residency training programs are greater than that of medical students and medical schools, respectively. The annual number of graduates from residency programs is approximately 2,500, whereas,

20 Grumbach, Kevin, et al. "Underrepresented Minorities and Medical Education in California: Recent Trends in Declining Admissions." A report issued by the Center for California Health Workforce Studies, UCSF. March 1999.

21 Grumbach, Kevin, et al. "Holding onto Our Own: Migration Patterns of Underrepresented Minority Californians in Medicine." A report issued by UCSF California Policy and Research Center/Program on Access to Care. October 2001.

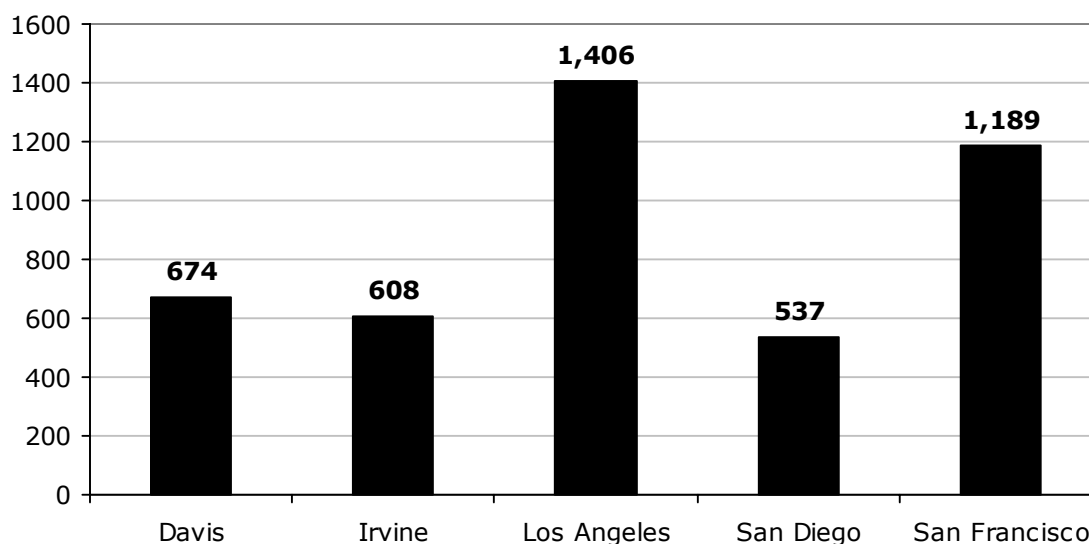
## 7. Training California's Health Professionals

there are approximately 1,200 California medical school graduates per year (including those receiving a D.O.).

In 1999, there were 673 residency programs with 8,643 residents enrolled in California.<sup>22</sup> Among all states, California accounted for the second largest level of residency programs. UC has more than 250 residency training programs in virtually all specialties and subspecialties of medicine. Annually, there are more than 4,000 residents.<sup>23</sup>

***In terms of UC's share of medical training in California, approximately 50% of the state's residents (8,662) were enrolled in UC and UC-affiliated programs in 1997.***<sup>24</sup> The remaining residents were enrolled in other university and non-university based (e.g., Kaiser) programs. The University of Southern California accounted for approximately 50% of non-UC medical residents in California.

**Figure 7-3.**  
**UC Medical Residents by Campus, 2000-01**  
(excludes extended-year residents)



Source: UCOP, *Changing Directions in Medical Education: Update on Systemwide Efforts to Increase the Training of Generalists* (7th report), July 2002. Appendix A, Table C.

22 Bureau of Health Professions, National Center for Health Workforce Information and Analysis data for Allopathic (M.D.) Graduate Medical Education, 1999.

23 In 2000-2001, there were 4,414 residents (excluding extended year residents) in UC residency training programs. Source: UCOP, *Changing Directions in Medical Education* (7th report), Appendix A, Table C.

24 Grumbach, Kevin, et al. "Underrepresented Minorities and Medical Education in California: Recent Trends in Declining Admissions." A Report by the Center for California Health Workforce Studies at UCSF. March 1999.

### Training Other Health Professionals: Nurses, Pharmacists and Optometrists

Health services professionals, including physicians, made up 7% of California's total employment in 1998, according to the U.S. Department of Health and Human Services.

These health practitioners are registered nurses, licensed practical nurses, direct care workers (nursing aides, orderlies and attendants), physician assistants, non-physician clinicians (chiropractors, podiatrists, optometrists, opticians), pharmacists, allied health therapists, technicians and technologists, dieticians and nutritionists. Their role in the care and support of patients' needs is substantial.

This section profiles the contributions that UC's schools of nursing, pharmacy and optometry make to California's health care workforce.

#### **Nurses**

Registered nurses comprise the single largest group of health professionals. Nurses are critical to the day-to-day functioning of medical facilities, providing a significant portion of patients' direct care and interacting more frequently with patients and their families than other health professionals.

Like a growing number of other states, California is facing a nursing shortage. The education and training of nurses is especially crucial in California, where the state's concentration of nurses per 100,000 population was significantly below the national average. California ranked last among all states in 1996. For licensed nurse practitioners—registered nurses with graduate level training in diagnostic and health assessment skills, with the training and licensing to provide basic medical care—the state ranked only slightly better, at 47th. Approximately 55% of RNs in the state completed their nursing education in a California school, up slightly since 1990.<sup>25</sup>

In 1996-97, approximately 2,000 baccalaureate degrees and 500 masters/doctoral degrees were awarded in California. This level has remained fairly steady since 1993-94.<sup>26</sup> While there is a large share of RNs with diploma and associate degrees, there is a rising trend in the number of nursing students seeking baccalaureate degrees. The last decade also saw an increasing number of nurses continuing their education, completing a master's or doctorate degree.<sup>27</sup>

According to a study published by UC San Francisco's Center for Health Professions entitled "Nursing in California: A Workforce Crisis" (Coffman et al, 2001), public universities and colleges play a very key role in supplying the market with well-trained and educated nurses as the predominant providers of nursing education in

25 "The Registered Nurse Population: Findings from the National Sample Survey of Registered Nurses," 2000

26 U.S. Department of Health and Human Services, Bureau of Health Professions, *State Health Workforce Profiles*

27 Barnes, Carole. "Survey of Registered Nurses in California, 1997," 1999; Coffman et al, "Nursing in California: A Workforce Crisis," 2001.

the state. New nurses for California will likely come from expanding nursing educational resources and opportunities within the state.

UC provides important contributions to the education and training of registered nurses at the baccalaureate and masters/doctoral levels. UC has two nationally ranked nursing schools at the San Francisco and Los Angeles campuses. In 2000, UC San Francisco's nursing school ranked second overall and first for adult and pediatric nurse practitioners. In 2001, it was also the second-largest recipient of NIH funding. In 2001, UC San Francisco's total enrollment was 540, consisting of graduate students only.

UCLA's nursing school had a total enrollment of 294, consisting of 25 undergraduate students and 269 graduate students. Across both campuses and levels, the number of nursing enrollments grew by 2% between Fall 2000 and Fall 2001. Specifically, UCLA witnessed increasing undergraduate enrollment trends since Fall 2000, while UC San Francisco graduate nursing enrollment grew. The growth in UCLA's undergraduate enrollment is consistent with the increasing state and national trend of associate and baccalaureate degree programs as the source of basic nursing education, replacing diploma programs.<sup>28</sup>

In 1998, 5,059 students graduated from RN programs in California. Of those graduates, approximately two-thirds were from associate degree programs, and one-third from baccalaureate programs. In 1999, UCLA graduated 118 nursing students (both undergraduate and graduate level). There are roughly 190 nursing students who receive UCSF graduate degrees annually. Assuming a steady level of graduates from the state's RN programs since 1998, UC constitutes 6% of the state's nursing graduates annually, with approximately 2.3% from UCLA and nearly 4% from UCSF. UC offers one of the largest graduate-level nursing programs in California, and accounts for a significant number of the highly skilled nurse practitioners trained in the state.

### ***Pharmacists***

There is a nationwide shortage of pharmacists as a result of increased demand for pharmacy services and declining pharmacy school applications, according to a 2000 study by the U.S. Health Resources and Services Administration National Center for Health Workforce. This shortage means less time for pharmacists to counsel patients, greater potential for fatigue-related pharmacist errors, and fewer pharmacy school faculty. Benchmarked to other states, California's pharmacist shortage is more severe relative to the state's population. In 1998, the state had 16,770 pharmacists, falling significantly below the national average and ranking second-to-last among all states in terms of pharmacists per 100,000 population, according to the U.S. Department of Health and Human Services.

UC plays a significant role in the education and training of pharmacists through UC San Francisco's school of pharmacy—the first college of pharmacy in the West and a

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28 *The University of California Statistical Summary of Students and Staff, Fall 2001.*

top-ranked pharmacy program in the nation. UC established a second school at its San Diego campus in July 2000, admitting its first class in Fall 2002.

In Fall 2001, UCSF pharmacy school enrollment totaled 590, consisting of 560 graduate students and 30 residents. In 1999, UC awarded 113 pharmacy degrees, accounting for 24% of all pharmacy degrees awarded in the state. UCSD is projecting an enrollment of 240 Pharm.D. students, 60 Ph.D. students and 30 pharmacy residents by 2005. The school will also offer post-Pharm.D. pharmacy practice and specialty residencies and a continuing education program for practicing pharmacists.

### ***Optometrists***

California's per capita optometrist level is above the national average. UC Berkeley's school of optometry is vital in sustaining an adequate supply of optometrists in California, especially to address the growing primary eye care needs of the state's residents, including seniors. In Fall 2001, UC Berkeley's optometry school enrolled 264 students, consisting of 116 undergraduates, 137 graduate students and 11 residents. In 1999, UC awarded 60 degrees in optometry, accounting for 38.7% of California's total optometry graduates.<sup>29</sup>

For more information about these schools, and UC's schools of dentistry, public health and veterinary medicine, visit UC's web site at <http://www.universityofcalifornia.edu/health/schools.html>.

## **UC Efforts to Address California's Physician Workforce Needs**

Demographically, Latinos, African-Americans, and Native Americans are underrepresented in California's physician workforce relative to their share of the state's population. This can be a detriment to health care access among these groups, as it is well documented that that underrepresented minorities (African American, Mexican-American, Native American and mainland Puerto-Rican) are more likely as physicians to practice in underserved communities and care for uninsured and Medi-Cal patients. Studies of the migration patterns of underrepresented minority Californians in medicine, such as those conducted by the California Medical Student Diversity Task Force and the Center for California Health Workforce Studies, have also shown that those who attend undergraduate medical education programs in the state are more likely to enter residency programs and practice in California.

### ***Addressing Geographic and Specialty Distribution***

Generally, larger metropolitan areas such as Los Angeles, San Diego, Greater Sacramento and the Bay Area have the highest concentrations of total physicians,

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<sup>29</sup> *Ibid.*

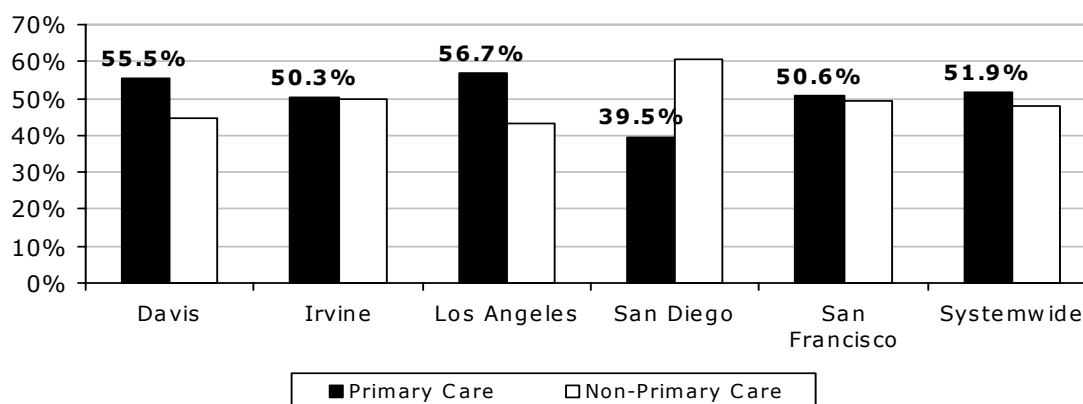


falling within or above the range of Council on Graduate Medical Education-recommended physicians per 100,000 population. Rural and valley areas of California such as the Central Valley and other areas inland and towards the east have a much lower concentration of total physicians that is below COGME's recommendations of 145-185 physicians per 100,000. Even in regions with an ample supply of physicians, there are variations in the distributions at the county and sub-county (community/neighborhood) levels.

The California Office of Statewide Health Planning and Development assesses the supply of physicians at the sub-county levels. Sub-county areas with less than one primary care physician per 3,000 persons are designated as a Primary Care Health Professions Shortage Area. These areas are primarily rural areas or low-income urban areas in major metropolitan regions with largely minority populations. In 2000, there were 109 rural areas and 28 urban areas with this designation. Moreover, despite the competitive healthcare market in larger metropolitan areas, there has not been a significant trend of physician migration to areas with lower supply of physicians since 1994, based on American Medical Association data.<sup>30</sup>

Addressing the training experiences of physicians is an important strategy for encouraging medical residents to practice in medically underserved areas. Systemwide, a majority of UC residents are in primary care training. In 2000-01, there were 2,291 residents in primary care programs and 2,123 residents in non-primary care programs.<sup>31</sup>

**Figure 7-4.**  
**UC Medical Residents by Specialty, 2000-01**



Source: UCOP, *Changing Directions in Medical Education: Update on Systemwide Efforts to Increase the Training of Generalists (7th report)*, July 2002. Table A.

<sup>30</sup> California Workforce Initiative, *The Practice of Medicine in California: A Profile of the Physician Workforce*.

<sup>31</sup> UCOP, *Changing Directions in Medical Education: Update on Systemwide Efforts to Increase the Training of Generalists (7th report)*, July 2002. Table A.

***The achievement of a slightly higher ratio of generalists to specialists systemwide is attributed to UC's efforts in primary care training.*** This is reflected in UC medical graduates' decisions to enter primary care residency training programs over the years. In 2000, the percentage of UC medical school graduates selecting primary care training positions was: 61% at Davis, 55% at Irvine, 65% at Los Angeles, 56% at San Diego, and 61% at San Francisco.

An update on UC's systemwide efforts to increase the training of generalists was submitted to Governor Davis and the California Legislature in July 2002. The following are examples of the efforts detailed in *Changing Directions in Medical Education: Update on Systemwide Efforts to Increase the Training of Generalists (7th Report)*:

- Ongoing efforts by UC admissions to recruit and admit students with a demonstrated interest in primary care and/or a commitment to caring for medically underserved groups or communities within the state;
- Allocation of new resources to support expansion of outreach program dedicated to increasing the diversity of the pool of students interested in future health care careers. New initiatives include expansion of UC post-baccalaureate programs, liaison with local high schools and community colleges, and expansion of medical school preparation programs in partnership with UC undergraduate campuses;
- Dedication of new resources to offset educational expenses for first year UC medical students wishing to participate in elective summer preceptorships with family physicians;
- Continuing strong curricular emphasis for all UC medical students on core primary care competencies and the acquisition of learning skills required for effective practice in a wide range of health care delivery systems;
- Continuing changes in the distribution of UC residency positions resulting in 52% of trainees in primary care in 2000-01, with 17% of all positions in family practice;
- Reductions in non-primary care training programs, with a systemwide decrease of 282 positions since 1992-93; and
- Significant increases in the number and proportion of UC and UC-affiliated family practice position, with a 2000-01 enrollment of 745 residents—a 43% increase over UC's 1992-93 base year enrollment of 521 family practice residents.<sup>32</sup> Family practice is one area of primary care that has a strong community emphasis. UC's family practice programs seek out residents who have demonstrated a commitment to practice as generalists in the medical center's region, particularly in inner city and neighboring inland and rural areas. Family practice resident training programs are located in a variety of settings, including the university hospitals, community hospitals, and other community venues.

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<sup>32</sup> *Ibid.* Note: UC counts all residents in family practice affiliated programs as UC medical residents; and they receive a UC certificate upon graduating from the program.

**Figure 7-5.  
UC-Affiliated Family Practice Programs**

<b>AMC</b>	<b>Affiliated Family Practice Programs</b>
<b>Davis</b>	<ul style="list-style-type: none"> <li>▪ Contra Costa County Health Services (Martinez)</li> <li>▪ David Grant Medical Center, USAF (Travis AFB, Fairfield)</li> <li>▪ Doctors Medical Center (Modesto)</li> <li>▪ Mercy Medical Center (Redding)</li> <li>▪ San Joaquin General Hospital (Stockton)</li> <li>▪ Sutter Merced Medical Center (Merced)</li> <li>▪ Sutter Health/CHS (Sacramento)</li> </ul>
<b>Irvine</b>	<ul style="list-style-type: none"> <li>▪ Kaiser Hospital Orange County</li> <li>▪ Kern County Medical Center</li> <li>▪ Long Beach Memorial Medical Center</li> <li>▪ San Bernardino Medical Center</li> </ul>
<b>Los Angeles</b>	<ul style="list-style-type: none"> <li>▪ Harbor-UCLA Medical Center (Torrance)</li> <li>▪ Kaiser Permanente (LA)</li> <li>▪ Kaiser Permanente (Woodland Hills)</li> <li>▪ Northridge Medical Center (Northridge)</li> <li>▪ Santa Monica-UCLA Medical Center (Santa Monica)</li> <li>▪ Ventura County Medical Center (Ventura)</li> <li>▪ Pomona Program (Pomona)</li> </ul>
<b>San Diego</b>	<ul style="list-style-type: none"> <li>▪ Kaiser Fontana Medical Center</li> <li>▪ Sharp La Mesa Medical Center</li> </ul>
<b>San Francisco</b>	<ul style="list-style-type: none"> <li>▪ University Medical Center, Fresno</li> <li>▪ Sutter Medical Center, Santa Rosa</li> <li>▪ Natividad Medical Center, Salinas</li> </ul>

*Note: Sharp La Mesa Medical Center has announced the planned closure of the Family Practice training program when all current graduates complete training in June 2003.*

### UC Medical Education in the San Joaquin Valley

Several UC campuses—including Davis, Irvine, Los Angeles, San Diego and San Francisco—operate programs that play substantial roles in providing health care services to San Joaquin Valley residents and training medical professionals in the region.

Since 1974, the UCSF Fresno Medical Education Program has graduated approximately 75 doctors every year, totaling more than 2,000 physicians and at least half of them stay in the Valley to practice. UCSF Fresno's Office of Continuing Education provides educational opportunities for nearly 4,000 practicing physicians and health care professionals in the Central San Joaquin Valley each year.

As an academic teaching hospital affiliated with the UCLA, UCSD and UCI medical schools, Kern Medical Center in Bakersfield trains more than 100 residents each year, specializing in emergency medicine, family practice, internal medicine, obstetrics and gynecology, and surgery.

The UC Davis Network of Affiliated Family Practice Residency Programs consists of eight training programs, three of which are located in the San Joaquin Valley at San Joaquin General Hospital in Stockton, Doctors Medical Center in Modesto and Mercy Medical Center in Merced.

The UC Davis Family Nurse Practitioner/Physician Assistant Program educates health practitioners who will provide primary care in underserved regions and to underrepresented populations in California. The Fresno teaching center at the UC Center, Fresno enrolls students from Central California. Graduates receive certificates as FNP's, PAs or both after 24 months.

### Addressing Demographic Distribution

The lack of racial and ethnic diversity in California's physician workforce has been a pressing issue for the state. African-American and Latino physicians are more likely to practice in medically underserved communities than other minorities and whites. A number of sources indicate that this group of physicians also provides patient-care to a greater number of racial/ethnic minorities.<sup>33</sup> In terms of specialty distribution, Latinos, particularly Mexican-Americans, are also more likely to become generalists than specialists. In 2000, the representation of generalists among Mexican-Americans was 70% compared to 30% for whites. Other Latino and underrepresented minority physician populations have generalist/specialist distribution ratios that are closer to 50:50 (California Workforce Initiative).

Up until the early-1990's, UC saw gradual increases in the number of underrepresented students enroll at UC medical schools—a trend that was also reflected nationally. After several challenges to affirmative action, including Proposition 209's ban on state (including UC) preferences on the basis of sex, race,

<sup>33</sup> Grumbach, Kevin, et al. "Underrepresented Minorities and Medical Education in California: Recent Trends in Declining Admissions." A Report by the Center for California Health Workforce Studies at UCSF. March 1999.

color, ethnicity or national origin in public education, employment or contracting, enrollments of underrepresented minorities declined. Despite these setbacks, progress is being made.

Fall 2002 marked the first year in nearly a decade that enrollment of underrepresented students in all UC medical schools has increased, with a total of 182 first-year underrepresented students enrolled (17.6% of all students). This is a 16% increase over Fall 2001 when first-year underrepresented enrollment for all UC medical schools totaled 157 students.

Part of this increase is attributable to UC's numerous efforts to encourage underrepresented students to pursue medicine through ongoing outreach programs at various levels of the pre-medical educational pipeline—K-12, undergraduate and post-baccalaureate. UC offers campus tours, student mentoring, summer programs with stipends, research opportunities, MCAT preparation, college recruitment visits, workshops, high school visits, and K-12 student and teacher enrichment. Notably, the re-applicant and post-baccalaureate programs have been very successful. The following figure lists examples of UC programs detailed in California's Medical Student Diversity Task Force's *Special Report on Medical Student Diversity*.

Given that studies indicate that UC's role in educating underrepresented medical students is particularly important for addressing California's demographic, specialty and geographic needs, funding for disadvantaged students and continued support of outreach and faculty recruitment efforts will have significant implications on UC's ability to sustain and further improve this public benefit.

**Figure 7-6.  
Selected List of UC Medical Outreach Programs**

AMC	Outreach Programs
<b>Davis</b>	<ul style="list-style-type: none"> <li>Summer Academy Study Program (SASP)</li> <li>MEDI-CORPS</li> <li>Summer Undergraduate Research Program in Science and Engineering (SURPRISE)</li> <li>Various K-12 initiatives in Sacramento and Stockton school districts with high percentages of disadvantaged students (e.g., science/health clubs, medical student speakers, exposure programs, SAT study, pre-medical mentors, etc.)</li> <li>CSU and community college initiatives (e.g., examination preparation classes, health professional and peer counselors, clinical research and exposure programs, medical school application assistance and workshop)</li> </ul>
<b>Irvine</b>	<ul style="list-style-type: none"> <li>Outreach to 5th graders in the Santa Ana School District (1,200 5th graders involved per year)</li> <li>Outreach to High School Students in Orange and LA counties (approx. 350-500 students are served each year)</li> <li>Santa Ana High School Mentorship Program</li> <li>CAMPMED (medical mountain retreat for students)</li> <li>University and college outreach initiatives (e.g., pre-med workshops, conferences, medical campus tours, etc.)</li> </ul>
<b>Los Angeles</b>	<ul style="list-style-type: none"> <li>Pre-Medical Enrichment Program (PREP)</li> <li>Career-Based Outreach Program (CBOP)</li> <li>High School Pre-Medical Enrichment Program (HSPREP)</li> <li>Partners for Progress (mentoring program for students in the Compton High School District)</li> <li>Lennox-Hughes-UCLA Partnership (LHU) (outreach to students in the Lennox School District)</li> <li>Summer Research Program for Undergraduate Students</li> <li>Summer Research Program for Underrepresented Community College Students</li> <li>Chicano/Latino Medical Student Association (CMSA) and Statewide Supernetwork Mentoring Program</li> </ul> <p><b>Affiliated Programs</b></p> <ul style="list-style-type: none"> <li>UC Riverside Biomedical Sciences Program Head-Start</li> <li>King/Drew Medical Magnet High School (oldest health sciences magnet high school in the state; partnership between LA Unified and Charles R. Drew University of Medicine and Science)</li> </ul>
<b>San Diego</b>	<ul style="list-style-type: none"> <li>Consortium of High Schools/Undergraduate &amp; Medical Schools (science enrichment programs for 250 students in grades 7-12)</li> <li>Medi-Corps (tutorial program for 7th and 12th grade students in math, science, and SAT preparation)</li> <li>Howard Hughes Undergraduate Science Enrichment Program (HHUSEP)</li> </ul>
<b>San Francisco</b>	<ul style="list-style-type: none"> <li>Science Education Program (pairs local middle school teachers with science faculty)</li> <li>Science Education Partnership Summer Internship Program</li> <li>Summer Biomedical Internship Program (10 Central Valley high school students paired with faculty mentors in research programs)</li> <li>Chicanos in Health Education (UCSF students conduct conferences throughout the state)</li> <li>Community College Program (outreach visits to San Francisco City College, Laney College in Oakland, and the College of Marin)</li> <li>Admissions Workshop</li> <li>Undergraduate Preparation Program</li> </ul> <p><b>Affiliated Programs</b></p> <ul style="list-style-type: none"> <li>Area Health Education Center (funding from UC and Health Resources Services Administration is distributed to support community-academic partnerships in health professions shortages area)</li> <li>Health Education and Training Center Program (based at UCSF Fresno)</li> <li>UCSF Fresno's Latino Center for Medical Education and Research</li> <li>Doctor's Academy (program for students at Fresno Unified District's Sunnyside High School)</li> <li>Health Careers Opportunities Program (Partnership between Fresno Latino Center for Medical Education and Research and CSU Fresno)</li> <li>Health Professions Preparatory Institute (program for junior high school students in the Fresno Unified School District)</li> </ul>

## 8. Caring for Patients

### UC's Medical Centers

The University of California has a major impact on the delivery of health care services in California. As the state's largest university hospital system and fifth largest health care delivery system, UC intertwines patient care with research and education. The eight licensed general acute care and two licensed acute psychiatric hospitals at UC's five medical centers<sup>34</sup> provide primary care and more than 150 areas of specialty care medicine, including cancer, heart disease, burn care, multi-organ transplantation, orthopedics, high-risk obstetrics, neurological disorders, geriatric and pediatric specialties. All UC medical centers offer licensed psychiatric services, although only UC San Francisco and UCLA have separately licensed hospitals for these services.<sup>35</sup>

UC's medical centers also extend their services throughout the regions through offsite community-based offices, affiliations with non-UC medical facilities, and regional physician networks, which link area physicians to UC specialists.

With more than 4,860<sup>36</sup> faculty physicians, UC has the state's largest physician's practice next to Kaiser Permanente Medical Group.

***Including residents, nurses, technicians and health administrators, UC has more than 18,800 health care professionals and staff. Combined with UC's access to the most advanced and latest medical technologies (many of which were pioneered by UC researchers), the scale and scope afforded by this expansive system's health technology and workforce provide crucial, and often unparalleled, services to Californians.***

UC's numerous national and statewide distinctions are impressive. For example, UC's medical centers at Los Angeles and San Francisco consistently rank among the top medical centers in the nation. In 2002, UCLA ranked fifth and UCSF seventh in the annual survey of "America's Best Hospitals" conducted by *U.S. News & World Report*.<sup>37</sup>

Notwithstanding the intensive involvement in research, education, and training, the UC medical centers make a significant contribution to the state in terms of

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34 Unless otherwise noted, the figures in this section for calendar year and fiscal year 2000 are based on OSHPD's Hospital Annual Financial Report FY 2000 and the Annual Hospital Utilization Report 2000 (calendar year). See Appendix K for data source explanation.

35 In general, facilities licensed as "general acute care" can offer both general acute services and/or non-general acute services (chemical dependency, acute psychiatric, skilled nursing, and intermediate care) depending on their principle emphasis (i.e., general, Long Term Care, or single specialty). However, facilities with specific designations ("Chemical Dependency Recovery Hospital," "Psychiatric," "Psychiatric Health Facilities" or "PHF") do not offer general acute care services. GAC facilities make up the majority of facilities in the market. Additionally, GAC services represent the largest type of service provided in the health care market.

36 UCOP 2002 AMC Report.

37 The "America's Best Hospitals" methodology was devised in 1993 by the National Opinion Research Center at the University of Chicago, which carries it out and refines it.



addressing the health care needs of Californians. The faculty, students and staff at UC medical centers provide patient-care services medically valued at more than \$2 billion annually, accounting for more than 3.3 million clinic visits (8.1% of the state's total), over 239,000 ER visits (2.5%), and over 120,000 inpatient admissions (4%) a year (UCOP 2002 AMC report, OSHPD Hospital Utilization Report). Each of the five UC medical centers is a unique and valuable asset to its regional community and beyond, providing essential patient care and training for California's doctors and nurses.

### ***Davis***

UC Davis includes a general acute care hospital located in Sacramento—the only university hospital in the Greater Sacramento region. UC Davis is the leader in its regional market, providing the majority of services in a vast coverage area. In FY 2000, the hospital had a licensed bed capacity of 528 and more than 25,000 inpatient admissions and 800,000 outpatient visits. The UC Davis Medical Group consists of more than 550 physicians—more than 100 primary care and 450 specialty care physicians covering 150 areas of medicine. Through its primary care network, UC Davis delivers outpatient care at numerous locations throughout Northern California. Its affiliations include the Sacramento Veterans Affairs Medical Center and Shriners Hospital for Children Northern California.

### ***Irvine***

UC Irvine's medical center consists of a general acute care hospital located in the city of Orange. It is the only university hospital in Orange County, and it ranks among the top five medical centers in its local health services area.<sup>38</sup> In FY 2000, its 462-bed general acute care hospital had more than 15,000 inpatient admissions, which included more than 1,000 acute psychiatric inpatient admissions. The hospital also provided over 500,000 outpatient visits. It has more than 300 specialty physicians and 50 primary care doctors in its medical group, which also maintains outpatient facilities throughout various locations in Orange County, including UC Irvine family health centers in Anaheim, Santa Ana and Westminster.

UC Irvine's affiliations include the Long Beach Veterans Affairs Medical Center and Long Beach Memorial Medical Center. UC Irvine faculty physicians provide patient-care and conduct research, while interns and residents rotate through the VAMC for their medical training.

### ***Los Angeles***

UCLA's medical center runs the largest patient-care administration in the UC system, with more than 1,000 faculty physicians and 3,500 nurses, therapists, technologists and support personnel. In FY 2000, UCLA had a combined licensed bed capacity of 1,021 at its two general acute care hospitals in Westwood (UCLA's main campus) and Santa Monica. In FY 2000, the general acute care hospitals had

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<sup>38</sup> UCOP 2002 AMC Report.



more than 28,000 inpatient admissions and 730,000 outpatient visits. It also had 136-licensed beds at its separately licensed psychiatric facility—UCLA Neuropsychiatric Institute—which provides the medical center’s neuropsychiatric services. The psychiatric facility had more than 3,000 outpatient visits and 2,500 inpatient admissions. UCLA also administers a network of 10 community outpatient offices in the Los Angeles Metropolitan Area.

UCLA’s affiliations include Los Angeles County Harbor-UCLA Medical Center and the West Los Angeles Veterans Affairs Medical Center. All of Harbor’s estimated 205 full-time physicians are UCLA medical school faculty. All residents in training programs at Harbor-UCLA are also enrolled as UCLA graduate students.

### ***San Diego***

UC San Diego’s medical center has two licensed general acute care hospitals located in Hillcrest (UCSD Thornton Hospital) and the La Jolla campus, with a combined total capacity of 539 licensed beds in FY 2000. The hospitals had more than 390,000 outpatient visits and 22,000 inpatient admissions (including more than 1,000 acute psychiatric inpatients) in FY 2000.

UCSD’s affiliations include the San Diego Veterans Affairs Medical Center, which has the distinction of being the top VAMC in the nation in terms of research funding. It serves as a center for research for many UCSD medical faculty and a clinical education site for UCSD interns and residents.

### ***San Francisco***

UC San Francisco’s medical center consists of two general acute hospitals and one licensed psychiatric hospital in San Francisco. The general acute care hospitals, located at Parnassus Heights and Mount Zion, had a total licensed bed capacity of 560 in FY 2000. The hospitals had more than 20,000 inpatient acute admissions and one million outpatient visits. Also in FY 2000, the 24-bed psychiatric hospital—Langley Porter Neuropsychiatric Institute—had more than 800 acute psychiatric inpatient admissions and more than 21,000 outpatient visits.

UCSF’s affiliations include San Francisco General Hospital (SFGH) and San Francisco Veterans Affairs Medical Center. SFGH is a city-owned facility in which UCSF faculty, residents and interns provide all patient care, teaching and research. More than 600 UCSF faculty physicians and 850 UCSF residents rotate through SFGH for their medical training. San Francisco Veterans Affairs Medical Center has 591 physicians, most of whom are UCSF faculty, and 500 UCSF residents who rotate through the center for training.

UCSF also provides patient care services in the Central Valley through UCSF Fresno, a medical education residency program. UCSF Fresno residents provide training and patient care through a network of affiliated partners in the Fresno area, including University Medical Center, Community Medical Centers—Fresno and Clovis, Veterans Affairs Central California Health Care system, Children’s Hospital Central California, Saint Agnes Medical Center and Kaiser Permanente Fresno Medical Center.

### Capacity

The state’s health care market has been characterized by a growing and aging population, rising inpatient admissions, longer patient bed days, and increased demand for medical technology advances. These factors have led to rising hospital utilization in recent years. The increasing demand is compounded by a diminished supply of total beds in California and across the country. The reduction in capacity (in terms of the number of hospital beds) was due to downsizing and cost-saving capacity consolidation in the last decade. In the 1990s, total hospital beds per 1,000 population declined in the U.S. by 17% and in California declined by 12%.<sup>39</sup>

UC’s available bed capacity represented 3.3% of the total available beds (87,230) in all of California’s health care facilities in FY 2000. UC’s available beds include<sup>40</sup>:

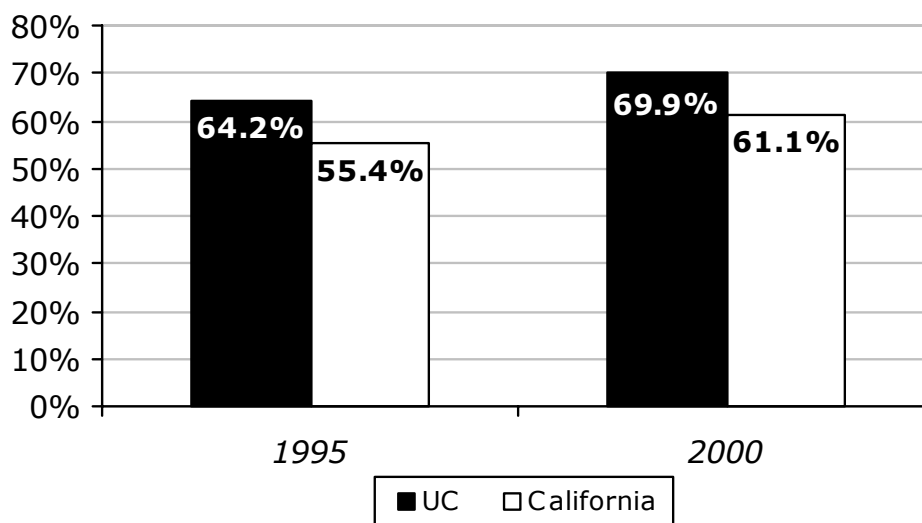
- Davis 471
- Irvine 383
- Los Angeles 981
- San Diego 498
- San Francisco 529

The following figure captures the rising trend in both UC and California available beds occupancy rates between FY 1995 and FY 2000, indicative of the increased burden on capacity. Despite maintaining a stable number of available beds during this period, UC’s growing and comparatively higher occupancy rates are indicative of a higher net new burden placed on the system. Based on these five-year trends, UC’s burden appears to be a result of increased demands on patient care services in California, rather than reduced supply. For example, UC’s inpatient days (excluding nursery) have increased from 653,600 in FY 1995 to 711,422 in FY 2000—almost a 9% growth.

<sup>39</sup> UCOP 2002 AMC Report.

<sup>40</sup> California Office of Statewide Health Planning and Development; see Appendix L for additional regional available bed statistics.

**Figure 8-1.**  
**UC and California Available Bed Occupancy Rates, FY 1995-2000**



*Notes: State figure excludes Kaiser, State, Shriners, LTC Emphasis, and PHFs*  
*Source: OSHPD Hospital Annual Financial Data Profiles, FY 1995 and FY 2000*

It is important to note that the available bed occupancy rate is measured as the percentage of beds occupied at midnight. Of course, this occupancy rate fluctuates throughout the day, as patients occupy bed at different point in times and with varying durations during the day. And, for most general acute care facilities (with the exception of long-term care emphasis), midnight is typically the lowest point of bed utilization during the day. Therefore, the available bed occupancy rate understates the burden placed on the facility at various points throughout the day. In many cases, an occupancy rate of 65% or above is indicative of a facility that likely reached full occupancy (100%) at certain points in the day. Thus, UC is generally considered to be at full occupancy at the busiest times during the day. Reduction in excess capacity—the margin between a facility’s average occupancy rate and its capacity—throughout the state in recent years has played a critical role in the overcrowding and hospital diversions experienced at many California’s medical facilities.

UC provides a very important component of the state’s health care infrastructure. However, due to the increasing demand pressures on its bed capacity, UC’s ability to further invest in capital projects will be a critical part of sustaining its impact on Californians and raising the overall capacity of the state’s inpatient bed supply. The critical challenge for the university will be to have the necessary funds for available bed and other capacity-building investments for California’s future healthcare market.

## Hospital Discharges

UC medical centers observe, diagnose and treat a high volume of California's inpatients, as indicated by its hospital discharges.<sup>41</sup> In 2000, UC had a total of 121,259 hospital discharges—115,023 general acute care<sup>42</sup> discharges and 6,236 acute psychiatric discharges (non general acute care<sup>43</sup>). The GAC discharges by center, according to OSHPD Annual Hospital Utilization Data Report, 2000:

- Davis 26,114
- Irvine 14,555
- Los Angeles 28,063
- San Diego 21,100
- San Francisco 25,191

UC's general acute care discharges accounted for approximately 4% of the state's total general acute care discharges (3,036,579), and 3.4% of the total acute psychiatric discharges (182,500) in the state. At the regional level<sup>44</sup>, UC's medical centers provide a significant level of inpatient care. For example, UC Davis had the largest number of discharges in its health services area<sup>45</sup> in 2000—13.5% of the total discharges. With a growing number of inpatients annually in the state, UC medical centers are an important source of present and future inpatient care regionally and statewide.

41 Data source: OSHPD Annual Hospital Utilization Reptot, 2000; OSHPD "California Acute Care Hospital Services Statewide Trends, 1991-2000."

42 General acute care (GAC) category consists of medical/surgical acute (includes GYN/DOU), perinatal (excludes nursery), pediatric acute, intensive care, coronary care, acute respiratory care, burn center, intensive care newborn nursery and rehabilitation center.

43 Non-GAC services consist of acute psychiatric care, skilled nursing, intermediate care, and Chemical Dependency Recovery Hospital. The latter three services are non-comparable markets for UC. While facilities licensed as GAC can offer both GAC and non-GAC service, a majority of the non-GAC services are offered at facilities that are exclusively designated for this type of care.

44 See Appendix M for regional hospital discharge statistics.

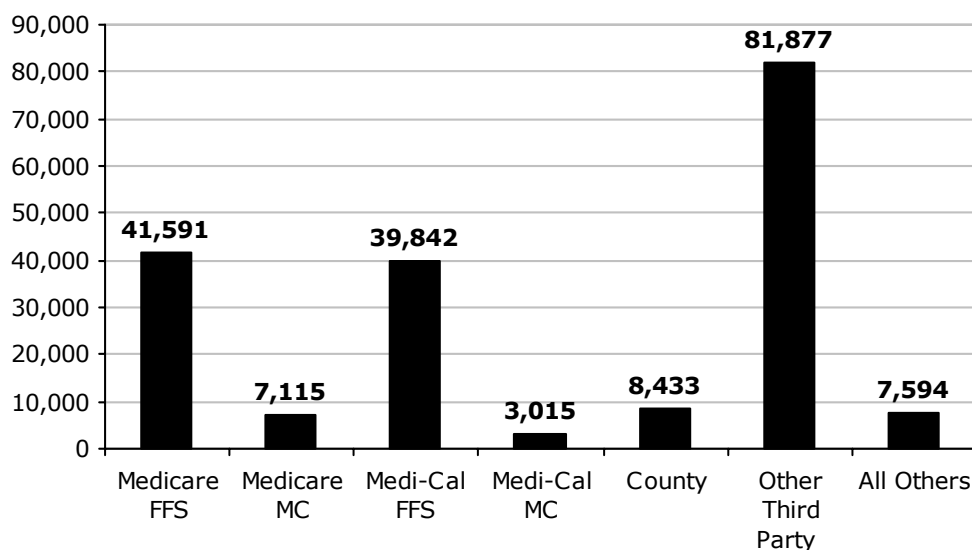
45 The health services area (HSA) is "a geographic area consisting of one or more contiguous counties designated by the U.S. Department of Health and Human Services for health planning on a regional basis" (California Office of Statewide Health Planning and Development). There are 14 health services areas in California: Northern California, Golden Empire, North Bay, West Bay, East Bay, North San Joaquin, Santa Clara, Mid Coast, Central, Santa Barbara/Ventura, LA County, Inland Counties, Orange County and San Diego/Imperial. Based on this classification, UC Davis is in Golden Empire (Sacramento, El Dorado, Sutter, Placer, Nevada, Sierra, Yolo and Yuba counties; UC Irvine is in Orange County; UCLA is in LA county; UC San Diego is in San Diego/Imperial counties, and UC San Francisco is in the West Bay (San Francisco, San Mateo and Marin counties). In many cases, these existing classifications underestimate the geographic reach of each medical center's market. For instance, UCSF and UCLA have market coverage that goes beyond the geographic scope of the West Bay and Los Angeles County regions, respectively.

## Medicare and Medi-Cal Patients

Given that the aging population is predicted to be one of the most important demographic factors driving health care demand in the near future,<sup>46</sup> Medicare utilization is an important measurement of patient-care impact in California. California's uninsured population has also been growing, especially due to the significant numbers of residents living in poverty. While the state's poverty rate declined slightly in recent years from 13.8% in 1999 to 12.9% in 2000, the 2000 rate exceeded the national level of 11.3%.<sup>47</sup> The services for California's Medi-Cal and indigent populations—many of whom fall near or below the poverty threshold—are also particularly critical when discussing health care impacts and services.

Medicare patients comprise a significant percentage of those treated by the university. In FY 2000, they totaled 43,881; of which 28,246 were managed care payers and 15,635 were traditional fee for service payers. Medicare patients accounted for the largest single population category of hospital discharges in the UC system (see Appendix N), and the second largest category of patient days as the following chart shows.

**Figure 8-2.**  
**UC Patient Days by Payer, 2000**



*Notes: FFS is fee for service; MC is managed care*

*Source: UCOP, June 2000 YTD data*

UC medical centers also serve large proportions of the state's growing Medi-Cal and indigent population segments. UC had 660,275 Medi-Cal outpatient visits, equaling

<sup>46</sup> UCOP 2002 AMC Report.

<sup>47</sup> United States Census Bureau. Current population survey, March 2001. Available online at [www.census.gov/population/www/index.html](http://www.census.gov/population/www/index.html).

15% of its total outpatient visits. Indigent outpatient visits totaled 86,306, accounting for 2.69% of its total outpatient visits. UC also had 29,236 Medi-Cal and 7,614 indigent hospital discharges, accounting for 23.57% and 6.14%, respectively, of its total hospital discharges. Compared to the average comparable health system, Medi-Cal and indigent populations constitute a relatively higher proportion of UC's total hospital discharges.

**Figure 8-3.**  
**Health Systems' Proportion of Total Hospital Discharges by Payer Type, FY 2000**

Health System	Medi-Cal Hospital Discharges as % of Total Hospital Discharges	Indigent Hospital Discharges as % of Total Hospital Discharges
<b>University of California</b>	23.57%	6.14%
Adventist Health	25.18%	1.39%
Catholic Healthcare West	20.73%	1.00%
Columbia/HCA Healthcare Corporation	15.23%	0.00%
County of Los Angeles	45.78%	41.12%
Memorial Health Services	7.63%	0.30%
San Diego Hospital Association	17.68%	1.90%
St. Joseph Health System	11.24%	1.37%
Sutter Health	15.74%	1.25%
Tenet Healthcare Corporation	18.15%	1.92%
<b>Average Proportion</b>	20.09%	5.64%

*Notes: Includes both GAC and non-GAC hospital discharges. Excludes nursery data. Behavioral Healthcare, Sun and Vencor health systems do not operate general acute care facilities.*

*Source: ICF Consulting; based on analysis of data from OSHPD Hospital Annual Financial Profiles, FY 2000. See Appendix N.*

Even at the regional level (health services area),<sup>48</sup> UC plays an important role in patient-care services for Medi-Cal and indigent populations (see Appendix N).

- UC Davis had 8,092 Medi-Cal discharges, accounting for 24.25% of the total inpatient Medi-Cal patients in its health services area. Additionally, there were 754 indigent discharges, accounting for 20.87% of the total inpatient indigents in its area. UC Davis provided the largest volume of inpatient care to Medi-Cal and indigent populations in the region.
- UC Irvine was the largest provider of inpatient care to poor populations in its health services area in FY 2000. It had 5,785 Medi-Cal discharges, accounting for 22.8% of the total Medi-Cal inpatients in its region. And, there were 1,466 indigent discharges, approximately 34.5% of the total indigent inpatients.

<sup>48</sup> Based on analysis of raw data from OSHPD Hospital Annual Financial Data Report, FY 2000. This analysis includes Kaiser, Shriners, LTC Emphasis and PHFs.

- UCLA had 5,548 Medi-Cal discharges and 104 indigent discharges in FY 2000.
- UC San Diego was the largest provider of inpatient care to poor populations in its region in FY 2000. It had 5,822 Medi-Cal discharges, representing approximately 12.8% of the total Medi-Cal inpatients in its health services area. UCSD also provided inpatient care to 1,556 indigents, accounting for 27.75% of the area's total.
- UC San Francisco had 3,989 Medi-Cal discharges, accounting for 13.8% of the total Medi-Cal inpatients in its health services area. It also had 231 indigent discharges, representing more than 10.3% of the total in this area. UCSF was the second-largest provider of inpatient care to Medi-Cal patients and the third-largest provider to indigents in its region.

The extent of UC's contributions to the health care of California's poor populations, particularly Medi-Cal patients, has important implications on the financial stability of the state's hospitals. For facilities, like UC's medical centers, which serve large proportions of Medi-Cal and indigent patients, uncompensated care costs present a significant financial challenge. Given the increasing trend in operating expenses, especially due to the rising wages and salaries of health professionals in the state and the rising costs of other inputs like pharmaceuticals and medical supplies, the limitations on revenues from Medi-Cal further constrain the operating margins of California's hospitals. The median operating margins in the state are significantly below national averages, and the range (3%-5%) considered adequate for financial stability. In California, there has been a declining trend in operating margins.

### **Selected Service Areas Important to Californians**

UC is a leader in dealing with many of the most difficult, life-saving procedures that Californians need. Emergency medical services and specialty/surgical care are two important niche areas of UC's patient-care services. In many cases, UC is a significant, and often exclusive, provider of specific services in these broad areas:

- *Emergency Medical Services (only GAC licensed facilities)*—A hospital's Emergency Medical Services (EMS) consists of emergency services and, in some cases, trauma services. EMS services are administered in an emergency room (ER) unit. Emergency services (ES) provide the immediate initial evaluation and treatment, and stabilization of acutely ill or injured patients on a 24-hour basis. There are three ES levels: stand-by, basic and comprehensive. An ER unit with basic or comprehensive ES level may also be designated as a trauma center, which signifies the additional availability of specialty/surgical care staff and resources (trauma team) on a 24-hour basis to treat injured patients.
- *Specialty/Surgical Care Services*—This type of care consists of non-primary services in secondary, tertiary and quaternary areas of patient-care. These services require specialized skills, technology, and/or support services. The tertiary and quaternary care services are high-end levels of care for very complicated conditions and procedures (i.e., pediatric invasive cardiology and



intra-uterine fetal surgery). They are typically offered at a limited number of highly specialized facilities.

### ***Emergency Medical Services***

Increasing utilization and overcrowding are presenting challenges for California hospital emergency rooms. According to OSHPD's "Statewide Perspectives in Healthcare 2001," between 1995 and 2000, the number of EMS visits increased from 8,858,268<sup>49</sup> to 9,652,416—an almost 9% growth in ER utilization. Despite the increasing demand, ER capacity has decreased due to hospital closures and mergers. In the last decade, 60 ERs have closed, including 10 since 1999.<sup>50</sup> The supply of hospital beds has also declined significantly in the 1990s.

The increasing utilization trends have implications on the state's reduced ER capacity. Due to increasing capacity constraints, California's ERs have had to increasingly resort to diversions—the practice of redirecting an ambulance from one hospital to another when the intended ER is at full capacity.<sup>51</sup> In 2000, some ERs in California reported diversions up to 50% of the time. Diversions are particularly problematic in Los Angeles, Sacramento, and San Diego counties. When an ambulance is diverted from the intended hospital (usually the nearest one with the appropriate qualifications), it can hamper the timely and efficient care of critically injured patients in what EMS personnel call the "golden hour"—the first 60 minutes of intensive care following a traumatic injury. Care given in this time period may be the difference between life and death. Homeland security and terrorist threats have also elevated the concerns over lack of ER capacity and readiness.

The increasing trends in utilization also have implications on hospitals' financial stability, as a significant number of EMS patients are without health insurance. In 2000, 82% of California hospitals lost a total of \$325 million in EMS revenue in uncompensated care costs, up 2.5% from the previous year.<sup>52</sup>

***UC is an important provider of emergency medical services, making a vital impact in a very challenged EMS environment in California. Because UC is the largest single provider of certain niche areas in emergency medicine, including trauma services, it provides services that, in many cases, cannot be diverted to other facilities. Because many of these patients are uninsured, this also increases the financial burden on UC to provide for patients who need life-saving traumatic services but cannot pay.***

The following sections cover the range of impacts that UC has in emergency medicine in terms of capacity and utilization.

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49 OSHPD, "Statewide Perspectives in Healthcare (2001)." The figure includes data from comparable GAC hospitals and Kaiser.

50 UCOP 2002 AMC Report.

51 Ibid.

52 *ibid.*



### ***Emergency Services Capacity***

The State Emergency Medical Services Authority (EMSA) licenses all ER units with one of the following classifications: standby, basic, or comprehensive. According to the California Office of Statewide Health Planning and Development, the standby level indicates that the facility is licensed to provide emergency medical care in a specifically designated area of the hospital (ER) that is equipped and maintained at all times to receive patients with urgent medical problems, and capable of providing physician services within a reasonable time.

The basic ES level certifies a facility's capability of providing emergency medical care in a specifically designated area of the hospital (ER) that is staffed and equipped at all times to provide prompt care for any patient presenting urgent medical problems. The highest ES level—"comprehensive"—certifies that the facility is capable of providing diagnostic and therapeutic services for unforeseen physical and mental disorders that, if not properly treated, would lead to marked suffering, disability, or death. The scope of services is comprehensive, with in-house capability for managing all medical situations on a definitive and continuing basis in a specifically designated area of the hospital (ER). UC has a total of four designated comprehensive ES centers and one basic ES center.

The ER units at the UC Davis, Irvine, Los Angeles and San Diego medical centers have comprehensive ES level designation (UC San Francisco has basic designation).

Only five other hospitals in California have the comprehensive ES level designation: Desert Regional Medical Center (Riverside County), Los Angeles County/USC Medical Center, Santa Clara Valley Medical Center, UC-affiliated San Francisco General Hospital and UC-affiliated University Medical Center (Fresno County). All the other reporting hospitals had ES level designation of basic or standby.

**UC's Davis, Irvine and San Diego medical centers  
are the exclusive providers of comprehensive  
emergency services in their respective regions.**

### **Trauma Services Capacity**

An ER unit can also be designated as a Level I, II, III or IV trauma center and Level I or II pediatric-only trauma center by the local EMSA. The staff, resource, patient volume, research and training requirements vary for each level, with Level I having the most comprehensive requirements and capable of treating the most severe and life-threatening injuries.<sup>53</sup> In general, an ER designated as a trauma center has

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<sup>53</sup> See California Code of Regulations, Title 22, Division 9, Chapter 7 on Trauma Care Systems for detailed information and requirements. Document is accessible on the State of California Emergency Medical Services Authority (EMSA) website.

immediately available surgical and non-surgical specialties and resources (i.e., intensive care unit, burn center, rehabilitation center, social service) on staff 24 hours a day. They are designated and licensed by the local EMSA as part of the agency's trauma care system plan for its jurisdiction. Trauma centers combine ES and trauma services (emergency specialty/surgical care capacities) to provide the highest level of care for injured patients. The trauma center designation requires a minimum of basic or comprehensive ES level.

California has 57 hospitals with ER trauma centers, 12 of which have the highest Level I designation. Four of these are the UC centers at: Davis, Irvine, Los Angeles and San Diego. UC Davis also has a Level I pediatric trauma center designation. UC San Francisco physicians staff San Francisco General Hospital's Level I trauma center. Also, UCLA physicians are on staff at Harbor's Level I trauma center.

UC is the exclusive provider of Level I trauma services in three regions:

- UC Davis has the only Level I and pediatric-only Level I trauma center designations in its health service area. It is the only medical center in the state to have both adult and pediatric trauma center designation.
- UC Irvine has the only Level I trauma center designation in Orange County.
- UC San Diego has the only Level I trauma center designation in the San Diego/Imperial health services area.

**UC's Davis, Irvine and San Diego medical centers are the exclusive providers of Level I trauma services in their respective regions.**

**Figure 8-4.**  
**High-Level EMS Capacity by Health System, 2000**

<b>Hospital</b>	<b>Number of Hospitals with Comprehensive ES Level Designation</b>	<b>Number of Designated Trauma Centers</b>
University of California	4	4
Adventist Health	0	0
Catholic HealthCare West	0	7
Columbia/HCA HealthCare Corporation	0	1
County of Los Angeles	1	3
Kaiser Foundation Hospitals	0	0
Memorial Health Services	0	1
Pacific Health Corporation	0	0
Sharp Healthcare	0	1
St. Joseph Health System	0	1
Sutter Health	0	2
Tenet HealthCare Corporation	1	2

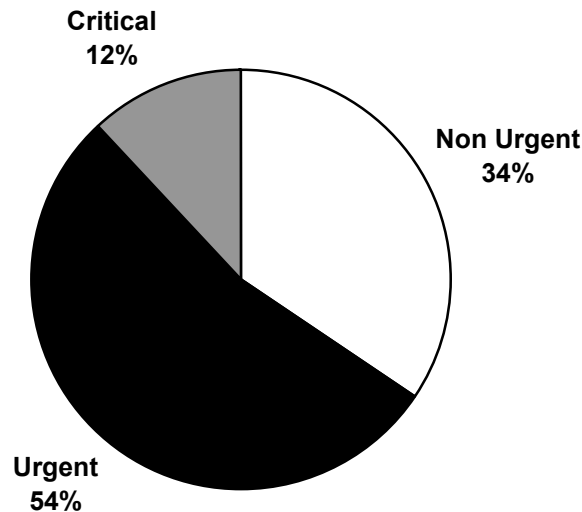
*Source: OSHPD Annual Hospital Utilization Profiles, 2000*

## **ER Utilization**

There are three classifications for ER visits: non-urgent, urgent, and critical. Non-urgent visits are those that can be treated in a non-emergency setting. Urgent visits involve an acute injury or illness where loss of life or limb is not an immediate threat or a patient who needs a timely evaluation (i.e., fracture or laceration). Critical visits are those that present an acute injury or illness that can result in permanent damage, injury or death.

In 2000, UC had 239,895 ER visits, accounting for 2.5% of the state's 9,652,416 total ER visits. As depicted in the following diagram, 82,462 were non-urgent ER visits (2.5% of 3,251,630), 128,799 were urgent ER visits (2.5% of 5,073,355), and 28,634 were critical ER visits (2.2% of 1,327,431). Urgent and critical emergency patients were more than 65% of UC's emergency population in 2000.

**Figure 8-5.**  
**UC Emergency Medical Services by ER Visit Type, 2000**



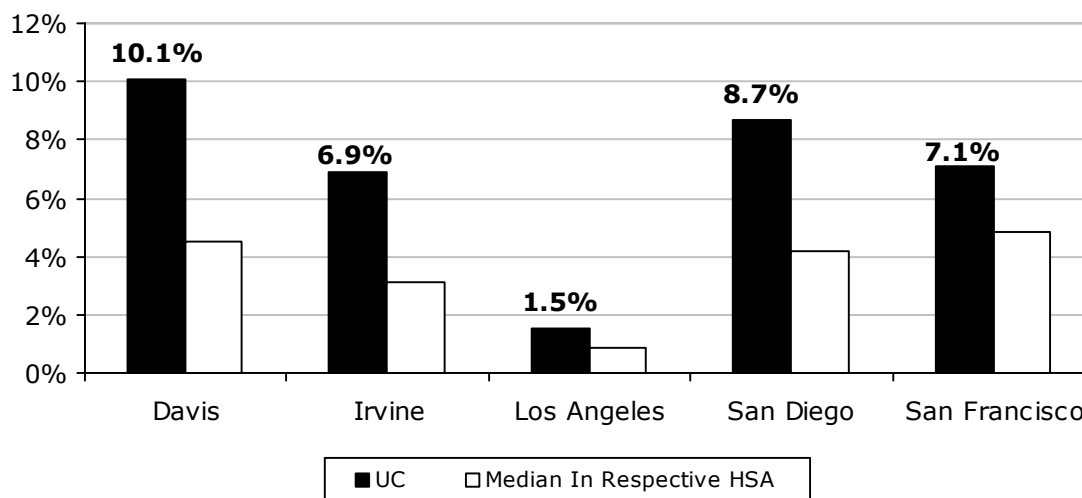
*Source: OSHPD Annual Hospital Utilization Profile, 2000*

On a regional basis, each UC medical center occupies a significant percent of its respective health services area, exceeding the median share as indicated in the following figure. In 2000, UC contributed the following to EMS in its respective health services areas (see Appendix O for statistical tables):

- UC Davis had 64,037 ER visits, accounting for 10.1% of the total ER visits in its health service area. It was the second-largest provider of EMS behind Kaiser Foundation Hospital (Sacramento). Given that it is the only provider of Level I adult and pediatric trauma services and the only ER designated as comprehensive in its health service area, UC's share also represents provisions for a vital segment of the market.
- UC Irvine had 41,992 ER visits, constituting 6.1% of the total visits in its health service area. It was the sixth-largest provider of EMS, albeit the exclusive provider of comprehensive EMS and Level I trauma services in its region.
- UCLA had 41,064 ER visits, accounting for nearly 2% of total ER utilization in its health service area. The center was among the top one-fourth largest EMS providers in the competitive Los Angeles County EMS region.
- UC San Diego had the second-largest number of ER visits in its health service area behind Kaiser Foundation Hospital (San Diego). Its 58,653 ER visits accounted for 8.7% of the total visits in the San Diego/Imperial health services area. As the exclusive provider of comprehensive EMS and level I trauma services, UC San Diego also handles some of the most serious ER visits in the region.
- UC San Francisco had 34,149 ER visits, accounting for 7.1% of its health service area's total, making it the fourth-largest EMS provider in its region in terms of

utilization. The most heavily utilized ER, SF General Hospital, has UCSF physicians on staff.

**Figure 8-6.**  
**UC's Share of Total Regional ER Visits, 2000**



Source: CF Consulting, based on analysis of raw data from OSHPD Annual Hospital Utilization Report, 2000. See Appendix O.

## Specialty/Surgical Care

Beyond routine and primary patient care services, the University of California is the state's leading provider of the most comprehensive range of secondary, tertiary and quaternary care, especially in terms of quality and complexity. UC has made a number of important contributions in more than 150 medical and surgical specialties and subspecialties, including oncology, hematology, endocrinology, neurology, orthopedics, perinatal, transplantation, and pediatrics. A significant number of UC's tertiary and quaternary care patients are referrals from non-UC primary and secondary patient-care facilities.

In terms of surgical care, UC performed 66,131 surgical procedures during 2000.

**Although UC does not account for the largest total volume of surgical services in California, it is often the only source for very difficult specialty procedures, and consistently has its medical centers ranked among the top hospitals nationwide for various specialty surgery areas.** In 2001, for example, UC had more than 12 specialties ranked among the nation's top 10 in *U.S. News and World Report's Best Hospitals* rankings.

One measure of the complexity of a hospital's services is the case mix index (CMI). Hospitals with a high CMI generally have more complex and severe patients. In 2001, the university's CMI ranged from 1.33 at Irvine to a high of 1.65 at UCLA. The UC index tends to be higher than both California and national averages. In 2001, the CMI at the average California hospital was 1.16; the nation's average teaching hospital had a CMI of 1.30. The complexity and severity of patients

treated at UC's medical centers distinguish UC's specialized services from other hospitals in the state.

The synergy of research and patient care uniquely positions teaching hospitals in the health care market. UC's academic medical centers provide "bench to bedside" environments, combining world-class health sciences research and top-quality patient care, allowing them to significantly advance medicine and specialty care areas that depend on basic and applied research. The integration of these experimental and innovative services through clinical research programs and centers can generate more immediate access to sophisticated technology and unparalleled benefits for patients.

The following specialty care areas profile some of the special centers and programs at UC's medical centers that combine research and patient care components, making an impact on the lives of those with serious or rare disorders in need of the most specialized services and the highest quality of care.

### Diabetes

Diabetes, a chronic endocrine disease with no known cure, affects around two million people in California. It can be controlled if detected early. However, it is often not detected until the individual suffers one of the many complications associated with the disease, including end-stage renal disease (kidney failure) or heart disease. In the United States, the incidence of reported kidney failure in people with diabetes is more than four times as high among African Americans, four to six times as high among Mexican Americans and six times as high among Native Americans than in the general population of diabetes patients. The endocrinology divisions at the UCLA and UC San Francisco medical centers oversee pioneering research, the highest-quality patient care and education at their diabetes centers, two of the leading facilities in the state.

- *UCLA's Gonda (Goldshmeid) Diabetes Center* provides patient care and educational services to approximately 15,000 patients per year with diabetes and other endocrine disorders. The center is the site for the UCLA medical school's clinical trials for diabetes developments.
- *UC San Francisco's Diabetes Center* provides research, education, and patient care to bring improvements in the quality of life of type 1 and 2 diabetes patients in the western United States. The center is currently performing four clinical trials: diabetes prevention trial; phase 1 / 2 trial of new treatment agent for type 1 diabetes mellitus; insulin pump therapy in type 1 children under six years of age; neurocognitive and neuroradiologic outcomes in children and young adults with type 1 diabetes. In addition to research, education and patient care are emphasized. The center established teaching programs in 1978. For example, pump initiation classes and one-day instruction in diabetic survival skills are offered. Two-day basic education in Chinese (Mandarin and Cantonese dialects), Russian and Spanish are provided on a regular basis.

### Cancer

UC has five National Cancer Institute-designated cancer centers. They are among 61 centers nationwide and nine in California. Four of the five UC cancer centers have the highest “comprehensive” level of designation. There are only six such centers in California, and only 39 cancer centers nationwide with this top designation. “Comprehensive” designation indicates that the center covers a full range of cancer research activities, including basic and clinical science, patient care, population studies, community outreach programs and cancer prevention education. The UC centers’ research and patient-care activities cover more than 40 specialties and sub-specialties, including breast, gastrointestinal, gynecological, hematological, liver, orthopedic, skin and urological cancers. All of the centers provide the most advanced cancer care services, including the latest laser and radiation therapies.

- *UC Davis’ Clinical Cancer Center* is the only NCI-designated cancer center between San Francisco and Portland. It works with UC-managed Lawrence Livermore National Laboratory to develop oncology technologies such as imaging and radiation treatments, making it the only cancer center to partner with a national laboratory to fight cancer. The center provides services to more than 3,000 patients a year from Central and Northern California, Eastern Nevada, and Southern Oregon. It also has 150 adult clinical trials and 50 pediatric clinical trials underway at any given time.
- *UC Irvine’s Chao Family Comprehensive Cancer Center* is the only center in Orange County designated by the National Cancer Institute as a comprehensive cancer center.
- *UCLA’s Jonsson Comprehensive Cancer Center* is the top-ranked cancer center in California and the western United States in terms of research and patient-care. In addition to the hundreds of clinical trials being conducted, the center receives more than 20,000 patient visits annually.
- *UC San Diego’s Comprehensive Cancer Center* serves thousands of patients every year. In FY 1998-99, the center recorded 19,506 patient visits. In addition to its patient-care services, the center has been a leader in cancer research and has been working on a number of promising advances for patients. For example, it is working with UC San Diego’s Scripps Institution of Oceanography to develop new chemotherapeutic agents from algae and other natural living sea organisms. The center also has an average of 200 ongoing clinical trials at any given time.
- *UC San Francisco’s Comprehensive Cancer Center* is the only cancer center in the Bay Area. It is also a top-ranked center in terms of NIH funding for cancer research.

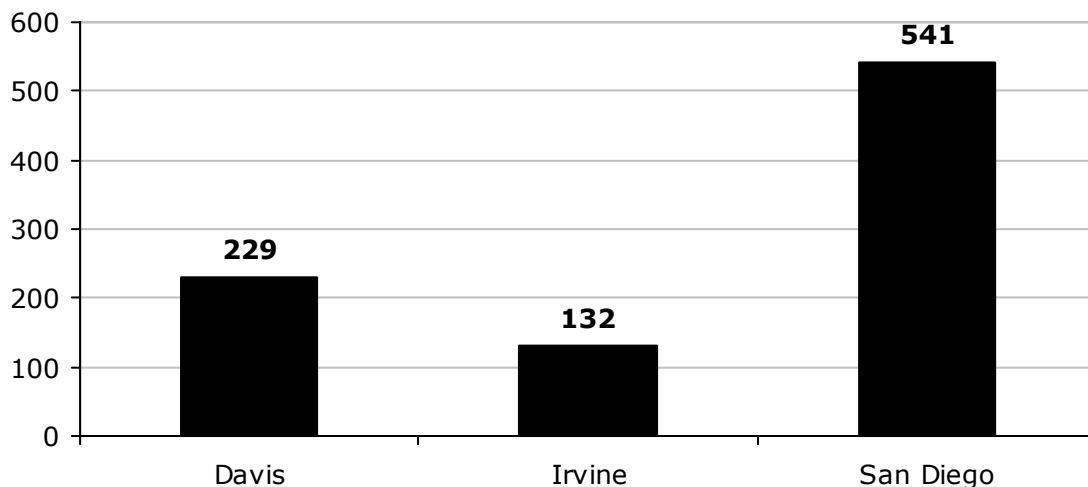
### Burn Care

Burn care capacity is an essential component of emergency care and preparedness in any state. UC has three leading burn centers that provide comprehensive

treatment and rehabilitation services for pediatric and adult burn patients. In 2000, the burn centers accounted for 24 of the 170 licensed beds (14%) for burn patients in California, recording more than 900 hospital discharges. The centers also research innovative methods to improve the care of their patients and provide support and community education. Regionally, these burn centers provide the most extensive and specialized services for all types of major and minor burns. Statewide, they are among the most active in the areas of patient care, research and education.

- *UC Davis' Regional Burn Center* was the first in the Sacramento area. It serves eight counties in the Greater Sacramento area and accepts patients from all over Northern California. It admits more than 200 patients and receives more than 2,000 outpatient visits per year. Among the center's strengths is research into the healing mechanism of burns at the cellular level.
- *UC Irvine's Regional Burn Center* treats more than 600 outpatients and inpatients per year with burns of all degrees. In 2000, the center recorded 132 inpatient admissions. Beyond patient care, its many research accomplishments include BioBrane, a synthetic skin that serves as a temporary skin for burn victims. Other significant research developments have been made in areas such as cadaver skin usage and immunosuppression techniques.
- *UC San Diego's Regional Burn Center* has the only comprehensive burn program in San Diego and Imperial region. In 2000, the center had 541 inpatients and many more outpatient visits from these counties.

**Figure 8-7.**  
**Number of Admissions by UC Burn Centers, 2000**



*Note: Admissions based on hospital discharges figures.*

*Source: OSHPD Hospital Utilization Profile Report, 2000.*



### Alzheimer's Disease

Alzheimer's disease affects more than four million Americans. Given the size of the state's aging population, this area of research and patient care is particularly important in California's health care market. All five UC medical centers have Alzheimer's programs within their neurology and neurosurgery departments. The Davis, Irvine, Los Angeles and San Diego campuses have facilities designated as national Alzheimer's Disease Centers (ADC). They are four of six such facilities in California and four of 29 centers nationally with this designation. The ADCs are leading institutions designated and funded by the NIH's National Institute on Aging. The centers conduct basic sciences and clinical research for Alzheimer's and other types of dementias to make advances in diagnosis and treatment, towards a possible cure or prevention.

UC also has seven clinical assessment locations that are state-designated Alzheimer's Disease Research Centers of California (ARCC). They provide advanced patient care, education, and support and are located in Fresno, San Francisco, Sacramento, Martinez, Los Angeles/San Fernando Valley, Irvine, and San Diego. The state Department of Health and Human Services administers California's 10 ARCC sites. For an Alzheimer's facility to receive this state designation, it must compete with other medical and research sites in California.

- *UC Davis' Alzheimer's Disease Research Center* is designated as one of two ADCs in Northern California (the other is the Stanford/VA Alzheimer's Disease Center). In addition to the approximately \$1.3 million annual research budget, UC Davis operates two ARCCs, providing care to approximately 250 patients per year, with treatment clinics located in Sacramento and Martinez.
- *UC Irvine's Institute for Brain Aging and Dementia* operates the only ARCC facility in Orange County.
- *UCLA's Alzheimer's Disease Research Center* is nationally designated by the National Institute on Aging as an ADC. Its ARCC provides patient-care services to over 500 patients per year in the Los Angeles and San Fernando Valley areas. UCLA's neurology and neurosurgery department was recently ranked 8th nationally (2nd in California) by *U.S. News and World Reports*. Its faculty physicians conduct numerous studies on experimental drugs for treatment of Alzheimer's patients.
- *UC San Diego's Alzheimer's Disease Research Center* was one of the original five facilities designated as ADCs in 1984 and one of California's first six ARCCs to be designated in 1985. Its ARCC facility is located in Chula Vista and has provided patient-care services to more than 200 people. It also sees approximately 10 participants per week in its La Jolla and Chula Vista Latino outreach clinics. It offers free testing to seniors at these clinics. The ADRC has also had more than 1,500 participants in its clinical research studies. Of particular note, the UC San Diego School of Medicine is a nationally recognized leader in neurosciences. As a result, it attracts an enormous amount of research dollars in neurosciences areas, such as Alzheimer's research. It recently received a \$54 million grant for an Alzheimer's Cooperative Disease Study.

- *UC San Francisco's Alzheimer's Disease Program* operates two ARCC locations in San Francisco and Fresno. In Fresno, it is part of the UCSF Fresno Medical Education Program and the CSU Fresno gerontology program. The Fresno ARCC serves a vast 10-county area in excess of 25,000 square miles, with patients from Fresno, Kern, Kings, Madera, Merced, Mariposa, Stanislaus, Tulare, San Luis Obispo, and Tuolumne Counties. The Fresno facility is the only state-funded center between Sacramento and Los Angeles. UCSF's neurology and neurosurgery department, which has shown strong expertise in the area of Alzheimer's research, was recently ranked 6th nationally and 1st in California by *U.S. News and World Reports*.

### Eye Care

UC boasts three major eye centers, which combine the expertise of leading UC clinical and research ophthalmologists and sub-specialists. They provide research, diagnosis and treatment in all areas of eye care for adult and pediatric patients, including cataract surgery, refractive surgery, vitreo-retinal surgery, eye alignment disorders, glaucoma, macular degeneration, neuro-ophthamology, oculoplastics and optometry. UC centers are major regional providers of innovative laser surgery techniques for vision correction, cataracts, glaucoma and other eye problems and diseases. These services are especially important to the many aging baby-boomers in California. Eye diseases, such as macular degeneration, are more prevalent among the elderly.

- *UCLA's Jules Stein Eye Institute and Doris Stein Eye Research Center* focuses on patient care, research and education. It serves more than 60,000 patients each year for eye care needs, from contact lenses to laser surgery for glaucoma. In 2002, the Jules Stein Eye Institute ranked 5th, one of two in California listed among the nation's top 10 of *U.S. News and World Reports'* best facilities for eye care.
- *UC San Diego's Shiley Eye Center* has nationally renowned research and clinical specialists who utilize all of the most advanced eye surgery techniques, including LASIX and various versions of the excimer laser surgery system. The center served approximately 46,000 patients in 2001.
- *UC San Francisco's Beckman Vision Correction Center* offers the largest surgical eye care program in Northern California. It offers highly specialized procedures, such as laser reshaping of the cornea. The center completed several Food and Drug Administration laser and non-laser studies of advanced technologies and procedures, including the NIDEK EC-5000 excimer laser system. It was one of eight sites nationwide to complete studies on this latest version of the excimer laser system, which provides the most advanced treatment for nearsightedness and astigmatism of all ranges. It is also one of few sites in the U.S. to offer training in the system. Because of the center's renowned research experts, this treatment and other innovations are readily available to patients. Their expertise spans all corneal and refractive surgery procedures. The center is currently

conducting research on a new non-contact laser for the treatment of farsighted patients.

### **Pediatrics / Children's Hospitals**

Children's hospitals, which serve all children regardless of ability to pay, are essential to the health of California's children, especially those from low-income and uninsured households. Almost one-third of California's children are enrolled in Medi-Cal and one in six children (approximately 1.7 million) in the state are uninsured.<sup>54</sup> In California, children on Medi-Cal represent almost half of their inpatient care (47%).<sup>55</sup> For this reason, nearly all of these hospitals are termed "disproportionate share hospitals" by Medi-Cal. However, because Medi-Cal reimbursements cover only 69%-80% of the actual patient care costs,<sup>56</sup> a hefty financial burden is placed on institutions that provide patient care to children. Low Medi-Cal reimbursement rates threaten the ability of children's hospitals to respond to the growing needs of California's children.

Despite some of the administrative challenges of serving the patient-care needs of children, UC provides the largest and most comprehensive pediatric medicine capacity in the state. With the exception of UC San Diego, all UC medical centers offer a comprehensive range of pediatric clinical services and research programs, as well as education and advocacy for children and their families. As integrated pediatric units within the UC medical center structure, they are termed "children's hospitals within hospitals." The UCLA and UC San Francisco children's hospitals have the top ranked pediatric programs in California behind only Children's Hospital of Los Angeles.<sup>57</sup> UC children's hospitals offer pediatric acute care in all areas of pediatric medicine—primary care (general pediatrics) and more than 40 specialty and subspecialty areas, including perinatal and neonatal units.

Designated as "Children's Hospitals" by the National Association of Children's Hospitals and Related Institutions (NACHRI), the UC children's hospitals are part of a national network of approximately 250 children's hospitals. In California, the UC children's hospitals are four of the 13 NACHRI designated children's hospitals. The non-UC children's hospitals include: Loma Linda University Children's Hospital, Children's Hospital of Los Angeles (CHLA), Shriners Hospitals for Children (Los Angeles), Children's Hospital of Central California (CHCC), Children's Hospital and Research Center of Oakland (CHRCO), Children's Hospital of Orange County (CHOC), Lucile Packard Children's Hospital at Stanford, Shriners Hospitals for Children (Sacramento), Sutter Children's Center (Sacramento) and Children's Hospital of San Diego (CHSD).

As regional centers for children's health, each UC children's hospital serves the important needs of its pediatric community. Like others, these hospitals improve

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<sup>54</sup> National Association of Children's Hospital and Related Institutions (NACHRI).

<sup>55</sup> *Ibid.*

<sup>56</sup> *Ibid.*

<sup>57</sup> US News and World Report, *pediatric rankings 2002*.

the lives of its young patients by providing a high quality of care in a child-friendly and hope-filled environment. And, as a leading provider of pediatric specialty care in California, UC dominates the California market in pediatric oncology, pediatric neurosurgery, pediatric invasive cardiology and pediatric transplant services.<sup>58</sup>

A multidisciplinary group of UC faculty physicians in the pediatrics department oversee outpatient and inpatient care at the UC children's hospitals:

- *UC Davis' Children's Hospital* is the only university-based children's hospital in its region. It is also Sacramento's only fully accredited, comprehensive hospital for children. The inpatient hospital includes a 36-bed tertiary neonatal intensive care unit, a 12-bed pediatric intensive care unit, and a 36-bed general pediatric unit. The hospital has the region's only pediatric intensive care unit, pediatric infectious diseases subspecialty group, and Level I pediatric trauma center (the pediatric emergency department alone receives approximately 14,000 visits per year). The hospital's physicians and researchers are also affiliated with Shriners Hospitals for Children (Sacramento).
- *UC Irvine's Children's Hospital* is one of only four facilities that provide specialized pediatric services for the Orange County region's children. Among these, it is the only university-based children's hospital in Orange County. The hospital has 55 pediatric sub-specialists, representing 14 specialties. UC Irvine pediatricians and pediatric sub-specialists have made significant contributions to research and education, including in childhood kidney transplantation, trauma care, the treatment of childhood cancers, and the management of attention deficit disorder and autism. Nearly 31,000 children were treated at UC Irvine in 2001, including 500 babies who were admitted to the Neonatal Intensive Care Unit.<sup>59</sup>
- *UCLA's Mattel Children's Hospital* contains a 120-bed inpatient hospital facility, which includes a 20-bed pediatric intensive unit and 23-bed Neonatal Intensive Care Unit. Renowned for pediatric bone marrow, heart, liver and kidney transplants, it is also known for its pioneering research, such as research into cloning disease genes and controlling intractable childhood epilepsy. UCLA faculty physicians are also affiliated with the pediatric units at Harbor-UCLA Medical Center, Martin Luther King/Drew University, Cedars-Sinai Medical Center and Olive View Medical Center.
- *UC San Diego's Department of Pediatrics* has been affiliated with Children's Hospital of San Diego since August 2001. Although it does not have a comprehensive pediatric unit, UCSD maintains a Neonatal Intensive Care Unit for high-risk obstetrics and offers other highly specialized acute pediatric services, such as pediatric burn care, because of the prohibitive cost of establishing these units at Children's Hospital of San Diego.

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<sup>58</sup> Based on presentation from UCOP Clinical Services Department, 1998. In addition to UC hospitals, only 10 other facilities in the state offered services in pediatric oncology, neurosurgery, and invasive cardiology in 1998.

<sup>59</sup> UC Irvine Children's Hospital news release, April 1, 2002.

- *UC San Francisco's Children's Hospital* is the top children's hospital in Northern California.<sup>60</sup> The hospital is the only university-based children's hospital in its region. It is also one of the largest pediatric facilities with 140 inpatient beds. Its pediatrics department has more than 150 medical and surgical experts in 50 pediatric specialties who develop cutting edge techniques and use innovative pediatric medicine protocols, particularly in bone marrow transplants and neonatal/fetal treatments. It has achieved a number of regional, state, national, and international milestones, including the one of the first to offer a Neonatal Intensive Care Unit. This unit treats more than 1,000 critically ill babies annually. The hospital is renowned for its highly specialized expertise in many areas, such as congenital heart disease and pediatric kidney and liver transplants. The hospital treats nearly 200 newborns with heart disease every year and has performed over 600 kidney and liver transplants. For pregnant women, the hospital offers a number of obstetric services through its Centers for Mothers and Newborns, especially for high-risk pregnancies. The hospital's Fetal Treatment Center has successfully completed a number of pioneering fetal surgeries, including performing the first open fetal surgery in 1981 (during which the fetus is partially removed from the uterus and then returned to the womb) and successful resuscitation of a fetus in 1996. And, the Prenatal Diagnosis Center offers screening, diagnosis, and counseling services. It has performed over 35,000 amniocentesis exams for birth defects, some for which UCSF health scientists pioneered the prenatal tests.

### Transplantation Services

**UC is the state's leader in high-risk transplantation services and advanced research in this area.**

**UC has survival and success rates that significantly exceed both state and national standards.**

According to the California Transplant Donor Network, more than 20,000 Americans receive organ transplants annually. More than 10,000 Californians need organ transplants as a result of various medical complications. All UC transplant programs are recognized as leading state and national programs for pediatric and adult transplants. UC has performed many of the most complicated kidney, liver, and heart transplants in California. They perform hundreds of single and multiple organ transplants each year for adult and pediatric patients. In 2001, UC performed 46% of all transplants in the state, including 45% of all adult transplants and 56% of all pediatric transplants.<sup>61</sup>

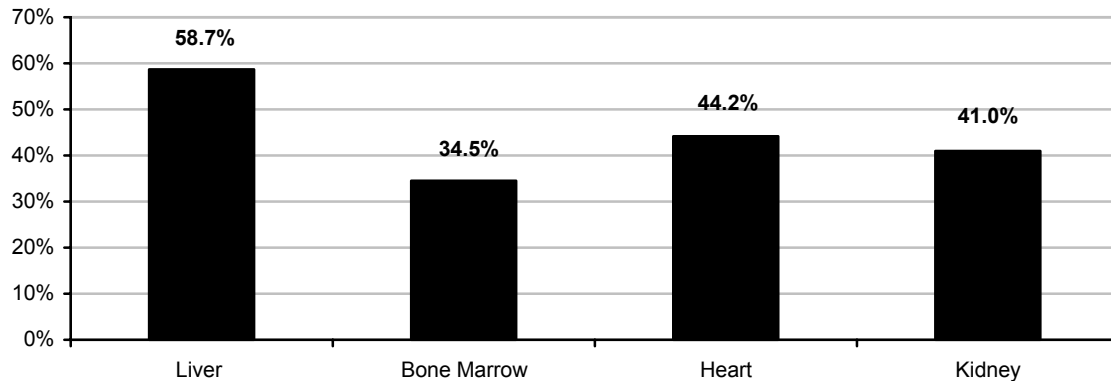
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<sup>60</sup> Based on US News and World Report, *pediatric rankings*, 2002.

<sup>61</sup> UCOP 2002 AMC Report.

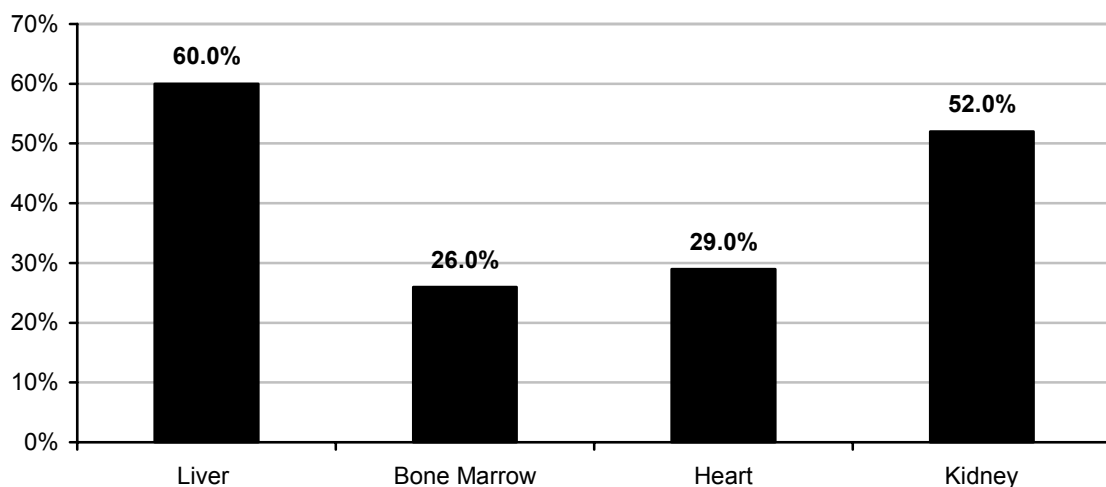
Numbers available from 2000<sup>62</sup> indicate that UC performed 334 liver transplants, 462 bone marrow transplants, 103 heart transplants and 587 kidney transplants. The largest provider of transplants in California, UC has made a significant impact in a range of transplant procedures.

**Figure 8-8.**  
**UC's Share of California's Transplants by Type**  
**(Total Adult and Pediatric), 2000**



*Source: UCOP Clinical Services Department; based on OSPHD Patient Discharge Data, 2000.*

**Figure 8-9.**  
**UC's Share of California's Transplants by Type**  
**(Pediatric Only), 1999**



*Source: UCOP Clinical Services Department; based on OSPHD 1999 Acute Care Discharge Data.*

<sup>62</sup> Based on data from UCOP Clinical Services Development Division.



In addition to providing transplants, transplant research is needed to continually provide innovative ways to improve procedures and improve the long-term benefits to patients. UC is a regional pioneer of a number of transplantation innovations, including the “split-liver” transplant procedure. This is an important service because the approach allows surgeons to use one donor liver for two liver transplant patients, thereby optimizing the use of a scarcely available organ. According to the Organ Procurement and Transplantation Network, which maintains the national patient waiting list, 17,438 patients are awaiting a liver transplant. Candidates typically wait a year or more for a liver transplant. Thus, these types of innovative services are very crucial, as they address organ shortages and offer new hope for people on waiting lists.

The following profiles provide a brief overview of each UC medical center’s transplant program and milestones. UC offers transplant services that are unparalleled in their respective markets and beyond.<sup>63</sup>

- *UC Davis’ Transplant Center* provides kidney, kidney-pancreas, liver, and bone marrow transplants. In 2000, it performed 15 liver, 36 bone marrow, and 41 kidney transplants. Since 1985, it has performed over 500 transplants. Between 1994 and 1999, the center performed 72 liver transplants. The UC Davis transplant program was the first on the West Coast to offer a reduction in the size of the incision to remove the kidneys of living donors. This technique reduces hospitalization and recovery time. The center also houses the UC Davis Transplant Research Institute, which explores application of basic science and clinical research in organ transplantation.
- *UC Irvine’s Division of Transplantation* is a major provider of bone-marrow/stem cell, kidney and liver transplants in the Orange County region. In 2000, UC Irvine performed 15 liver, five bone marrow and 11 kidney transplants. To date, more than 600 kidney transplants and 70 liver transplants have been performed at the UC Irvine Medical Center. It also has Orange County’s only liver transplant program and the only Orange County facility offering the “split-liver” procedure. At UC Irvine, the survival rate following liver transplantation is about 10% higher than the national rate.<sup>64</sup> In 1988, a UC Irvine surgeon performed the first heart transplant in Orange County.<sup>65</sup>
- *UCLA’s Transplantation Services* is the largest multi-organ transplant center in the United States for adult and pediatric patients. In 2000, UCLA was the largest provider of liver, heart and kidney transplants in California (170, 84 and 262 transplants respectively). In fact, UCLA was the first to offer bone marrow, kidney, heart, liver and pancreas transplant programs together at one hospital in the western United States in 1987. UCLA also performed the first live-donor liver transplant in Southern California in 1993. To date, UCLA has performed

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63 Transplant figures from 2000 combine adult and pediatric totals. They were provided by UCOP Clinical Services Department from 2000 OSHPD Patient Discharge Data. All other figures are from literature and news releases from each UC medical center.

64 UC Irvine Transplant Health News article entitled “Health on Hold.”

65 UC Irvine does not currently have a heart transplant program.

more than 1,100 heart transplants. In 2001, it was the first hospital in Southern California to complete 1,000 heart transplants.<sup>66</sup>

- *UC San Diego's Transplantation Services* offers heart, kidney, pancreas-kidney, lung, liver and bone marrow transplants. In 2000, it performed 31 liver, 49 bone marrow, 12 heart and 90 kidney transplants. It has achieved numerous regional milestones, including the region's first double-lung transplant in 1991. It also performed the region's first pancreas-kidney transplant and performed its 1,000th kidney transplant surgery in 1993. It also performed San Diego's first living related-donor lung transplant in 1993. In 1994, UC San Diego heart/lung transplant team performed the first infant heart transplant in San Diego's history. In 1998, UC San Diego Blood and Marrow Transplant Program was designated as the only National Marrow Donor Program-approved transplant center in San Diego. In 1999, UC San Diego Transplant Center performed San Diego's first pediatric liver transplant. Also in 1999, UC San Diego performed San Diego County's first split-liver transplant, saving two lives with one organ.
- *UC San Francisco's Transplantation Services* offers kidney, liver, heart, lung and pancreas transplants. In 2000, UCSF performed 89 liver, 185 bone marrow, seven heart and 183 kidney transplants. It was the second-largest provider of liver and kidney transplants in the state in 2000. UCSF is also internationally renowned for these services—especially its kidney transplant program, which is the world's largest to date. It has performed the most kidney transplants (6,000). Its kidney transplant program is also the second-largest for living-donor kidney transplants in the country. UCSF is a primary kidney transplant referral center for the western U.S. and one of the country's leading institutions for children's kidney transplants. In conjunction with their diabetes center, they are distinguished for their treatment of diabetic transplant cases. They have performed more than 200 combined pancreas/kidney transplants in type 1 diabetics. In addition to kidney transplants, they have performed more than 1,328 liver transplants and 90 lung transplants to date.

### Psychiatric Services

According to the National Mental Health Association, estimated 54 million Americans suffer from mental disorders. In California, the number of acute psychiatric care discharges has increased 10% between 1991 and 2000.<sup>67</sup> Although there have been obstacles towards providing quality care in the area due to a historical stigma of mental illness and often fragmented delivery of mental health care, it has received more attention and resources from health professionals and public policy officials in the recent years. In 2002, for example, President Bush announced the creation of the President's New Freedom Commission on Mental Health to address the challenges in mental health and provide more commitment to

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<sup>66</sup> UCLA website under transplantation services news section, posted March 9, 2001.

<sup>67</sup> OSHPD "California Acute Care Hospital Services Statewide Trends, 1991-2000." In 1991, there were 165,286 acute psychiatric care discharges; in 2000, there were 182,500 acute psychiatric care discharges.



patients.<sup>68</sup> This area of medicine has a direct impact on many social issues, including poverty, homelessness, drug abuse and crime. Treating acute psychiatric disorders and developing new medications, treatments, and possible cures to mental health illness is vital to advancing the health and quality of life of individuals suffering from mental disorders.

With the growing number of mental health patients and the increasing awareness of mental health issues, it is important that UC provides advanced patient-care while conducting research on the most severe and complex neuropsychiatric illnesses and disorders. All five UC medical centers have a multidisciplinary team of mental health and neurological professionals who represent a range of specialties and subspecialties in the areas of child and adolescent, adult and geriatric psychiatry. The departments also have forensic psychiatry units that provide consultation services to law firms and courts throughout California. UC's psychiatry and related departments are known for their customized programs and individual approach, which allow their physicians and staff to effectively provide treatment and care for many disorders, such as autism, eating disorders, substance abuse, schizophrenia and depression, on a case-by-case basis in a variety of treatment settings.

As mentioned earlier, UC's acute psychiatric care discharges accounted for 3.4% of the total in the state (182,500) in 2000. The on-site services at UC San Francisco and UCLA are offered in separately licensed facilities, while the services at UC's other three medical centers are integrated within the acute care facilities. Each center also conducts clinical research and offers consultative services and clinical programs onsite and throughout non-UC locations in its region, including the affiliated VA hospitals and county regional clinics. UC also has collaborative relationships with community mental health, social service, and self-help groups, thereby ensuring a strong support system and community connection in their respective regions.

- *UC Davis' Department of Psychiatry and Behavioral Sciences* provides outpatient clinical services and consultations. The department's physicians also engage in a wide variety of research areas including neuroscience; clinical processes; the causes, cures and neuropsychiatry of major psychiatric disorders; quality of care; sleep; gerontology; medical education; child and adolescent psychiatry; clinical psychopharmacology; as well as the use of telepsychiatry in rural areas. The department's ongoing commitment in neuroscience has included the expansion of its neuroimaging center and the utilization of a new 3-T magnet for research that provides an advanced neuroimaging capability. The psychiatry department's faculty also participates in research at the medical center's Medical Investigation of Neurodevelopmental Disorders (M.I.N.D) Center. Other research sites include the Veterans Affairs Medical Center/UC Davis Sleep Laboratory and Child Development Center, Napa State Hospital, Lawrence Berkeley Laboratory and the Davis campus' Center for Neuroscience and the California Regional Primate Research Center. The department has a number of ongoing

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<sup>68</sup> U.S. Mental Health Commission.

collaborations, including the collaboration with the Mental Health Division of the County of Sacramento and UCLA Department of Psychiatry's PsychREHAB on the Sacramento County Psychosocial Options for Rehabilitation Training (SacPORT) project. SacPORT was initiated to complement mental health services in Sacramento County in helping patients with severe and persistent illness return to a more functional life in the community.

- *UC Irvine's Neuropsychiatric Center* is an inpatient and outpatient facility at the UC Irvine Medical Center, housing most of the faculty physicians from the Clinical Division of the UC Irvine Department of Psychiatry and Human Behavior. Its 90-bed inpatient hospital includes two adult inpatient units, a child/adolescent inpatient unit, a geriatric and medical psychiatric unit, and a research unit. The outpatient clinic receives more than 13,000 patient visits per year. The center specializes in schizophrenia, and attention deficit and eating disorders. It also houses a mental retardation center, which has the distinction of being one of only 14 recognized by the National Institute of Child Health and Human Development.
- *UCLA's Neuropsychiatric Institute*, a separately licensed psychiatric facility, is a leading center for a broad range of inpatient and outpatient care, research, and education. The 136-bed hospital discharged 2,512 patients in 2000. It has the distinction of being the top-ranked psychiatric facility in California and the 6th-ranked in the nation.<sup>69</sup> The neurology department at the UCLA School of Medicine, one of the founding divisions of the multidisciplinary institute, has a major nationally renowned research faculty. The institute is organized into 11 research centers and two research laboratories. The institute supports more than 20 clinical care initiatives at its hospital and collaborates with UCLA's Brain Research Institute. In fact, neuroscience is the largest academic discipline at UCLA.
- *UC San Diego's Department of Psychiatry* conducts research and provides inpatient and outpatient services for the UCSD medical center and affiliate locations at Mercy Hospital (San Diego) and San Diego Veterans Affairs Medical Center. UCSD's 18-bed inpatient psychiatric unit, referred to as the Neuropsychiatry and Behavioral Medicine Unit, is the primary psychiatry clinical site. In addition to the outpatient services onsite, the department's Mental Health Clinical Research Center is an outpatient NIMH-funded clinical research center that is located at the San Diego VAMC. This special unit is involved in clinical psychobiological and psychopharmacological research of patients with affective disorders. Additionally, the Alcohol and Drug Treatment Program is a 29-bed inpatient alcohol and drug treatment program based at the San Diego VAMC. UC San Diego's nationally known Alcohol Research Program and Dual Diagnosis Program bases much of its research out of the ADTP. The department's physicians also conduct research at various multidisciplinary centers at UCSD, including the HIV Neurobehavioral Research Center and the Center for Medicinal Cannabis Research.

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<sup>69</sup> US News and World Report *rankings of psychiatric facilities, 2002*.

- *UC San Francisco's Langley Porter Neuropsychiatric Institute* is a separately licensed psychiatric facility. The psychiatry department's 170 faculty conduct research and patient-care at the facility across all areas of psychiatry and related fields such as neurology and health psychology. The institute is the third-ranked psychiatric hospital behind UCLA and Stanford's facilities and the 18th-ranked facility nationwide.<sup>70</sup> The hospital has a 24-bed acute psychiatric inpatient unit, which had 892 hospital discharges in 2000. The mental health professionals offer outpatient care and consultation services onsite and at various locations in San Francisco. The institute is also an important source of research in more than 15 areas of basic sciences and clinical mental health, receiving approximately \$25 million per year in extramural grants and contracts from UCSF-administered fund sources (e.g., NIH, UC, private sector) and those administered by VA/Northern California Institute for Research and Education (NCIRE), a private, non-profit organization that administers grants from VA based researchers. For the academic year 2001-2002, the psychiatry department's extramural research support (including research training grants) consisted of 83 UCSF-administered extramural research totaling \$18.4 million annually and 28 VA/NCIRE-administered extramural research totaling \$3.9 million a year. The institute is affiliated with the Veterans Affairs Medical Center, Edgewood Center for Families and Children, Kaiser Division of Research and San Francisco General Hospital. The psychiatry department's faculty physicians also provide services in the Central Valley through UCSF Fresno.<sup>71</sup>

### Miscellaneous Specialty Care Milestones

- UC San Diego pioneered the Pulmonary Thromboendarterectomy (PTE) operation in 1970. The complex procedure removes life-threatening blood clots from the lungs. UC San Diego cardiothoracic and pulmonary critical care units have performed the PTE operation more than 1,500 times, exceeding the combined total number of PTEs performed at all other facilities worldwide. Currently, the hospital averages approximately 14 operations per month. Additionally, UC San Diego's morality rate for this procedure in the last three years is 4.5%, the lowest in the world.
- UC San Francisco opened the nation's first AIDS outpatient clinic and hospital ward in 1983 at UC-affiliate San Francisco General Hospital.
- Kidney stone removal was accomplished non-surgically with a lithotripter for the first time on the West Coast in 1985 at UCLA.
- UC San Diego was designated as one of eight national centers for AIDS research and treatment in 1986.
- UC Irvine was the first in Southern California to use laser angioplasty to open a blocked artery in 1986.

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<sup>70</sup> US News and World Report, 2002

<sup>71</sup> Office of the Chair, UCSF Department of Psychiatry.

- UC Irvine performed the first West Coast operation to implant an insulin pump in a diabetic in 1987.
- UC San Diego's Women's Health Services, in 1993, was named one of 16 Vanguard Centers for the Women's Health Initiative of the NIH. As part of this initiative, UC San Diego received funding for a 12-year study of post-menopausal women, with an emphasis on Latina women.
- San Diego's first minimally invasive coronary artery bypass surgery was completed by UC San Diego. The innovative surgery is performed through a small incision in the chest wall and dramatically reduces hospitalization time.
- The UCLA/UC Irvine Liver Transplant Program is the only program in Orange County that utilizes the "split liver" technique, which uses one donor liver for two or more patients.
- Gamma Knife Radiosurgery is utilized by UC San Francisco physicians. It is the only hospital in Northern California with the latest "C" model knife. It allows for shortened treatment times for adults and children with brain tumors, arterial malformations, and other neurological conditions.
- The Movement Disorders Surgery Program at UC San Francisco is the largest of its kind in the western US. Patients with Parkinson's disease, tremor and dystonia receive advanced treatment, including deep brain stimulation.
- UC San Francisco's Thoracic Surgery Program has the largest surgical volume with the best outcomes in Northern California for all thoracic patients.
- In 2000, UC San Diego became one of 20 sites in the U.S.—and the only location in Southern California—to be chosen for a new Manic Depression Treatment Program.
- In 2002, UCLA surgeons successfully separated Guatemalan twins conjoined at the head (craniopagus twins) after more than 22 hours of surgery at Mattel Children's Hospital. Approximately 2,000 international patients receive patient-care services every year. This is indicative of UCLA's strong patient-care reputation, especially for its advanced treatment capabilities, here and abroad. UC is also the exclusive provider of separation surgeries in California.

## Uncompensated Care Costs

Uncompensated care costs<sup>72</sup> consist of three types of charity: philanthropy, bad debt (unreimbursed costs) and contractual adjustments. UC's medical centers serve large and disproportionate numbers of Medi-Cal and indigent populations, especially in emergency services and pediatric care. In addition to the unrecovered costs of services to these groups due to low reimbursement rates, many of UC's specialized services are provided on a philanthropic basis. UC provides patient care to those in unique medical situations despite the inability to pay. For example, the recent

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<sup>72</sup> Due to the inconsistency in the reporting of uncompensated care costs to OSHPD, comparative analysis and benchmarking are not reported in this section.

separation of the Guatemalan twins at UCLA will cost more than \$1.5 million, all of which is being donated by UCLA and charities.

UC also offers significant patient care through free community health clinics. In FY 2002, philanthropic charity alone was estimated at \$45,049,000 for the entire UC health care system. Including the unrecovered costs of Medi-Cal and county services, UC's patient-care charity was estimated at \$203,264,000 for FY 2002.

The following figures show the uncompensated care costs for each UC medical center (excluding contractual adjustment figures). Given that UC San Diego's medical center has a unique and extensive community health outreach program, it is not surprising that it has the largest level of philanthropic charity in the UC system. UC Davis' estimated costs of charity care in excess of reimbursements for Medi-Cal and county services was also much higher than other UC medical centers in FY 2002 due to its largely unreimbursed contract with Sacramento County and its very unique position in its market, especially for Level I pediatric and adult trauma services. As discussed earlier, a significant amount of emergency services goes uncompensated. UCLA and UC San Francisco medical centers have the next highest levels because they are not designated as "disproportionate share hospitals," and therefore do not receive additional funding for indigent care. For this reason, services to the poor are even less compensated compared to UC Irvine and UC San Diego, which are "disproportionate share hospitals."

**Figure 8-10.**  
**Estimated Cost of UC's Charity Care (Philanthropic Charity Only), FY 2002**

UC Medical Center	Estimated Cost of Charity Care (Philanthropic Charity Only)
Davis	\$6,979,000
Irvine	\$14,408,000
Los Angeles	\$5,316,000
San Diego	\$16,067,000
San Francisco	\$2,279,000

**Figure 8-11.**  
**Estimated Cost of UC's Charity Care in Excess of Reimbursement for Medi-Cal and County Services, FY 2002**

UC Medical Center	Estimated Cost of Charity Care in Excess of Reimbursement for Medi-Cal and County Services
Davis	\$136,810,000
Irvine	\$14,224,000
Los Angeles	\$21,369,000
San Diego	\$4,861,000
San Francisco	\$26,000,000



## 9. Expanding Access: UC's Community Health Programs

The University of California is also maintaining and improving the health of Californians through community outreach projects, health care clinics and technology initiatives. For example, UC San Diego has more than 100 community-based health programs and clinics, serving a broad demographic population in the San Diego region. Many of these programs focus on education, prevention and early intervention. In many cases, these services are needed to avert health crises in populations that lack access to health care.

Health care access is a pressing issue among low-income working families, especially Latino and African-American families. This is a result of (1) lack of insurance, (2) inadequate insurance coverage, or (3) knowledge of complex special program eligibility requirements and applications (i.e., Medi-Cal or Healthy Families). Factors contributing to this disparity include socio-economic status, and welfare reform measures, limited English proficiency, lack of employer-based insurance and limited education. According to a joint study by the UC Berkeley Center for Health and Public Policy Studies and the UCLA Center for Health Policy Research,<sup>73</sup> more than seven million Californians were without health insurance in 1997. Roughly one-third of uninsured adults did not seek medical services when they needed it, compared to 7% among insured adult residents.

UC's community health outreach programs serve populations who lack access to basic, affordable health care. UC has more than 100 affiliated Veterans Affairs, county, and community-based clinics. Telemedicine operations and primary care provider networks service geographically dispersed populations throughout California. UC Davis, Irvine and San Diego facilities and programs provide health care uninsured and underinsured patients in San Diego, Sacramento and Orange counties, respectively. UC health outreach services include:

### ***UC San Francisco's Community Programs***

- The UCSF medical school coordinates the San Francisco Health Care for the Homeless Program and sponsors two homeless clinics in the city. According to the Mayor's Office, there were 7,305 homeless people in San Francisco in 2001.
- The UCSF Cancer Center's Mobile Mammography Van program provides mammogram and breast cancer awareness services to thousands of underserved women in the Bay Area. The van travels to community health clinics in the area, administering 30 mammograms daily.
- Homeless Veterans Health Care.
- Community Health Fairs.
- Diabetes Teaching Center.

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<sup>73</sup> The State of Health Insurance in California, 1998 is issued by the Health Insurance Policy Program, a joint project of the UC Berkeley Center for Health and Public Policy Studies and the UCLA Center for Health Policy Research.



***UCSF Fresno Medical Education Program***

The UCSF Fresno Medical Education Program serves the San Joaquin Valley area. The program was established to address the region's shortage of physicians and limited access to medical education. The program is formally affiliated with the University Medical Center, the major teaching hospital in the Central Valley. The program, which serves a diverse population, is also home to the Latino Center for Medical Education and Research.

***UC Davis Clinics***

UC Davis has a number of free clinics, organized and operated by undergraduates and graduate students. The majority of the staff are faculty, medical and dental professionals, medical students, post-baccalaureate students and undergraduate pre-medical students who volunteer their time. These clinics, established in the Sacramento and Davis areas, have been successful in serving the region's underserved populations:

- Paul Hom Asian Clinic is the oldest Asian health clinic in the nation.
- Clinica Tepati is a student-run clinic that provides free primary health care services to the uninsured population of Sacramento and the surrounding area.
- Davis Community Clinic provides primary health care to low-income, uninsured and Medi-Cal eligible residents of the Yolo region.
- Imani Clinic provides medical services that address the needs of the African-American community.

***UC Davis' Telemedicine Service***

Among the largest telemedicine initiatives in the nation, this service aims to improve access to medical care, especially specialty care services, in remote areas. The program electronically connects rural physicians and patients in the state's most distant locations with UC physicians so that they have access to cutting-edge training and techniques. It has provided services to more than 2,000 patient consults in the Central Valley communities with few medical specialists. The Office of Regional Outreach and Telehealth also launched the UC Davis Telemedicine Learning Center in 1999 to provide telemedicine training. UC Davis has also committed resources to creating a Southern California telemedicine learning center.

***UC Davis' Physician-Patient Electronic Messaging Initiative***

This e-messaging system, which has been piloted by physicians at the UC Davis primary care network since November 2001, is a secure device from Healinx Corporation that allows patients and physicians to view and modify lists of problems, medications, and messages. As of April 2002, the pilot program included 11 physicians and 550 patients. The network plans to increase access and usage. Preliminary feedback from users indicates the e-messaging system has the potential to improve patient care, including reduced load and waits on physician administration phone lines. (For more information, see the July 2002 report by First



Consulting Group on "Crossing the Chasm with Information Technology: Bridging the Quality Gap in Health Care.")

### ***UC Irvine's Medical Services for Indigents Program***

This program serves the medically indigent populations in Orange County. UCI Medical Center is one of 25 hospitals contracted by the county to provide medical care for MSI patients. However, UCI provides a significant portion of the care to more than 20,000 indigent patients in Orange County—63% of the county's MSI outpatient care and almost 30% of its inpatient care. UCI has an average of 18-20 MSI patients in the hospital on any given day, compared to other county hospitals that have only one to two MSI patients per day.

### ***UCLA Medical School-Sponsored Projects***

UCLA's School of Medicine sponsors and operates a number of free clinics in the Greater Los Angeles area for underserved communities:

- American Indian Free Clinic offers a full range of primary and family medicine and dental services. The clinic features a pregnancy prevention program, an HIV prevention program, an alcohol recovery program, and family shelter. The alcohol recovery program and family shelter are located in Compton.
- UMMA Free Clinic, located in South-Central Los Angeles, provides free medical services to people who do not have access to health care in this primarily underserved area. It receives approximately 3,500 patients a year, all from within a five-mile radius of the clinic. Sixty percent of the patients served are Latinos, 40% are African-Americans. According to the Latino Issues Forum, this area of Los Angeles has the highest rate of uninsured residents in the state.
- UCLA/Salvation Army Outreach Clinic, run by UCLA medical students, has two locations in the Westwood Salvation Army Transitional Housing Village and the Samoshel Clinic. Patients are referred to UCLA Medical Center when necessary.
- Los Angeles Free Clinic provides medical and dental services, including mental health, domestic violence, HIV/AIDS and legal services, primarily for children and young adults.
- UCLA's Alzheimer's Disease Research Center runs two Alzheimer's clinics at Drew Medical Center in South Central Los Angeles and the Sepulveda VA in North San Fernando Valley. The center increases awareness of Alzheimer's and offers evaluations, diagnosis, education, support, counseling and referrals. A recent study funded by the National Institute on Aging found that some unknown genetic or environmental factors are increasing the risk for Alzheimer's in African-American and some Latino groups.

### ***UC San Diego's Electronic Capture of Diabetes Data***

UC San Diego's electronic capture of diabetes data is improving the quality of access and patient-care. Using iMetrikus' Medcompass system, a patient registry for diabetes management, UCSD physicians are able to monitor patient data. The primary outreach value of this technology has been improved monitoring, physician-patient communication, and care during and after clinic visits. (For more information, see the July 2002 report by First Consulting Group on "Crossing the Chasm with Information Technology: Bridging the Quality Gap in Health Care.")

### ***UC San Diego's Promoting Health in the Community***

UCSD's Promoting Health in the Community includes more than 120 public health outreach services for the San Diego community. The programs provide education and patient-care services at a number of clinics throughout the region. A number of these programs are dedicated to community involvement in cancer and burn prevention and treatment, children and adolescent services, women's health issues, geriatric health issues, and immigrant and minority-focused programs. Many use the "Train the Trainer" model, which educates community members to be health advocates. Some programs also conduct outreach at frequented neighborhood sites, like grocery stores and beauty salons.

UC San Diego is a leader in the nation for primary care and family and preventive medicine. Its family and preventive medicine department ranks 1st in NIH funding among peer departments in the United States. UCSD also had the largest uncompensated care costs (charity) in the UC system, totaling \$16,834,361 in FY 2000. UCSD's Promoting Health in the Community activities, especially ones that target underserved populations, include:

- The Community Oncologists' Clinical Trials Education Program focuses on clinical trials for patients with special emphasis placed on educating minority patients.
- The Center for AIDS Research and Education Services (C.A.R.E.S) treats HIV positive individuals. Doctors, nurses, receptionists and lab technicians volunteer to operate the clinic. They have a caseload of 1,500 clients, with more than 9,100 medical service and 11,500 social service visits annually.
- The African American Cosmetologists Promoting Health program promotes breast health and breast cancer prevention education to the African American community through beauty salons. The innovative and highly effective program trains cosmetologists in early detection and prevention of breast cancer and diabetes so they can in turn educate their patrons. The program collaborates with 24 beauty salons and more than 85 stylists who have been trained in breast cancer and diabetes education and prevention.
- The Pacific Asian Grocery Store Cancer Education project uses Asian grocery stores to disseminate information about cancer prevention, early detection and clinical trials to San Diego's Asian and Pacific Islander communities. The staff is made up of bicultural and bilingual UC San Diego undergraduates trained to work as community health educators.

## 9. Expanding Access: UC's Community Health Programs



- Por la Vida is a public health intervention program implemented in Latino communities that begun in the early 1990s by UCSD community pediatrics. The outreach program educates underserved members of the Latino community about early detection and prevention of cervical and breast cancers. A new component of the project includes nutritional education.
- At Casa de San Juan, UCSD family nurse practitioners provide health services in a residential facility for undocumented women and teenagers who are waiting for amnesty hearings. The clinic assists 500 people annually.
- Clinica Medical Central provides prenatal care and family planning services in San Diego.
- The Immigrant/Refugee Health Studies Program provides health policy makers an overview of the challenges faced by immigrant and low-income Latinos in meeting their health care needs.
- Project Dulce (A Community Diabetes Care Program), initiated by Community Health Improvement Partners (CHIP), is a project of the Whittier Institute, managed in part by UCSD. Its mission is to improve the quality of life among low-income persons with diabetes, specifically with the Latino population, by addressing cultural, behavioral and health system barriers to optimal diabetes management.
- Through the Refugee Health Screening Program, UCSD faculty and family nurse practitioners provide five physical examinations per year to about 2,500 refugees.
- At the Southern Indian Health Council, Sycuan Medical Dental Center, and Indian Health Council, UC San Diego Community Pediatrics provides low- or no-cost health care to American Indian children at clinic sites in Northeastern (Valley Center) and Eastern (Campo, Alpine, and El Cajon) San Diego County.
- At the La Maestra Family Clinic, UC San Diego Department of Family Medicine faculty provide pediatric, obstetrical, gynecological, and other primary care services to medically underserved families, particularly women and children. Annually, they serve approximately 25,000-30,000 patients, who are primarily Latino.
- Women's Institute—Chula Vista and El Cajon is a clinic, run by nurse midwifery faculty that primarily serves low-income pregnant Latina women.

More information about UC's medical centers, health sciences schools, patient care and related research is available at [www.universityofcalifornia.edu/health](http://www.universityofcalifornia.edu/health).



## **HEALTH APPENDICES**



## J. UC ANR Research, Innovation and Outreach Highlights

The systemwide highlights were provided by UCOP; campus highlights were provided by respective ANR departments.

### Systemwide

#### *Production Innovations*

- Researchers discovered in the late 1800s how to remove salts from the “alkali” soils in California’s Central Valley, turning barren land into the world’s most productive farming region.
- A UC bacteriologist developed a heat process to kill the organism that causes botulism, the deadliest form of food poisoning. The 1920 discovery led to the world’s first regulations for canned food, fostering the modern canning industry.
- California’s strawberry industry was saved in the 1940s when UC scientists developed a hybrid plant resistant to a devastating virus. Today, California produces 75% of U.S. strawberries.
- UC scientists in 1946 stopped the “tristeza” virus from wiping out California’s citrus industry by creating a hybrid resistant to the virus. Previously, much of South American and South African citrus had died from tristeza.
- At least a half dozen varieties of tomatoes were developed by UC from 1956 to 1982. They represent as much as 85% of the nation’s production.
- UC advances in oyster, trout, striped bass and sturgeon culture fostered California’s seafood and fish farming industry; research also helped save native sturgeon.
- For five decades, UC scientists have advanced the basic understanding of important livestock diseases and developed vaccines and other preventive measures to combat such maladies as blue tongue virus and Newcastle disease.
- UC scientists in the 1960s and 1970s modernized farming with new machinery, such as tree-shaking devices for harvesting fruits and nuts, and the mechanical tomato harvester.
- More than a million people in Africa were fed and famine was averted by a black-eyed bean developed by UC in the 1980s. The bean, which thrives in drought-stricken Senegal, tripled crop productivity in one of the world’s harshest environments.
- UC scientists discovered that a gene in a common bacterium triggers frost damage in crops. In 1988, they altered the bacterium to prevent freezing and found that crops coated with the so-called “ice minus” bacterium were less susceptible to frost.

- The ash whitefly, which ruined crops in the West, was controlled by UC scientists in 1989, using a tiny stingless wasp that feeds on the flies. The fly was eradicated without pesticides.
- A new avocado variety, developed by UC in 1991, outproduces the industry mainstay by 2 to 1. The “Gwen” avocado equals the quality of the Hass, but is larger and more uniform.
- In 1992, tomatoes were genetically altered by UC scientists to turn ripe on cue, and remain ripe for as long as three months without spoiling. This discovery may help consumers, especially those in Third World countries, store fruit longer without refrigeration.
- More than 90% of California’s wheat is in UC varieties. UC breeding research yielded the first triple-disease-resistant wheat variety, as well as salt tolerant wheat that can utilize marginal soil and water.

### ***Human Health Innovations***

- Since the 1920s, UC scientists have pioneered discoveries in human nutrition, often in the course of animal research. They discovered, isolated, and defined the functions of important nutrients such as the coenzyme form of vitamin D, vitamin K, niacin, pantothenic acid, vitamin B6 (pyridoxine), vitamin A, and vitamin E.
- UC scientists elucidated the essential biological functions of these nutrients as well as their roles in various diseases, including pernicious anemia, obstructive jaundice, hemorrhaging in newborns, pellagra, and other anemias.
- In the 1950s, scientist identified oxidant damage to biological systems. Vitamins C and E, beta carotene and selenium were found to protect against oxidants in smog, sunlight, and toxic chemicals.
- UC researchers in 1990 performed the first robot-assisted surgery using a device they developed called “Robodoc” that cuts bone from hip implants. It carves a cavity with such precision that 96% of the implant is in contact with the bone.

### ***Pest Control Innovations***

- Since the turn of the century, UC scientists have helped develop more than 30 successful examples of classical biological control of crop pests. In Southern California coastal citrus, for instance, major pests such as red scale, citrus whitefly, black scale, yellow scale, red mite, snails and mealybugs are biologically controlled.
- Beginning in the 1950s, UC scientists coined the term “integrated control”—the forerunner of “integrated pest management” and pioneered these innovative principles.
- UC was the first to use insect diseases, rather than pesticides, to control insect pests. In 1951, scientists used a bacterium that infected a specific group of



insect pests to combat caterpillars that destroyed alfalfa. UC scientists founded the first Laboratory of Insect Pathology and discovered some 30 insect diseases.

- The first registered commercial insect pheromone formula was developed by UC scientists in collaboration with industry. The natural sex attractant that disrupts mating cycles was pioneered using slow release formulas through hollow fibers, allowing dispersal over several weeks.
- UC scientists developed a new generation of safer pesticides known as “proinsecticides.” While toxic to insects, the compounds were converted to nontoxic products by mammals.

### ***Environmental Innovations***

- UC foresters in 1947 developed cultivation practices that today are the standard for reseeded forests.
- A UC professor of natural history in 1972 founded UC’s Natural Reserve System, which today preserves more than 100,000 acres of pristine California land for teaching and research.
- UC scientists in 1987 found a way to remove toxic levels of selenium in soil using microbes that consume the trace element. Previously, soil microbes were too slow to be practical. UC scientists sped-up the process by adding activators.
- In the 1950s, ozone was discovered to be the most damaging air pollutant to plants and the most and least smog susceptible crops were identified.

### ***Miscellaneous Innovations***

- The photosynthetic process, by which plants use sunlight to change carbon dioxide and water into sugar, was discovered in 1954 by a UC scientist.
- A UC scientist was the first to identify the reaction center in photosynthesis. Research, conducted from 1972 to 1992, revealed that the reaction center is responsible for light absorption and energy transfer.
- The foundation for plant biotechnology and micrografting was established in the 1960s when UC plant scientists first developed parameters for growing plant cells in tissue culture. The techniques enabled scientists to generate whole plants—each a clone of its parent—from single cells. Today, these methods permit researchers to generate whole plants from genetically engineered cells.
- A UC research team in 1984 used genetic engineering to decode genes from a 20-million-year-old fossil magnolia leaf. By comparing old and new DNA, far-reaching conclusions are being made about evolution.
- UC scientists analyzed the oldest piece of genetic material ever found—DNA from a bee dating back as long as 40 million years. They proved in 1992 that DNA could survive longer than believed.
- Among the first transfers of “foreign” genes into woody plants were accomplished when genetically altered walnut and apple trees (carrying marker

genes) were field grown. This research will enable scientists to endow wood species with pest and disease, and other desirable traits.

- Since the 1930s, UC researchers have helped make California wines among the best in the world by developing new grape varieties and new winemaking techniques.
- UC scientists in the late 1950s developed a chemical treatment for fabric that prevents moths and carpet beetle larvae from eating wool fiber.

## **UC Berkeley**

- *Defense against Frost Damage and Fire Blight:* Professor Steve Lindow found that a common bacteria species, *Pseudomonas fluorescens*, can be genetically modified to protect plants from both frost damage and fire blight, the major disease of pears and apples worldwide. Blightban, a commercial spray containing the microbes, is now used on about 100,000 acres of pears and apples worldwide. Years ago, Professor Lindow discovered that a bacterium, and later a single gene in the microbe, is what makes frost normally form on plant leaves. Using recombinant DNA techniques, he disabled this "ice gene," and coated potato seed pieces with the modified microbe before planting. The strategy worked and has since been developed commercially.
- *Plant Mutation Yields Oil-Rich Roots:* CNR plant biologists led by Renee Sung discovered a mutation in plants that could lead to genetically engineered crops capable of storing vital reserves of oil or protein in taproots. This discovery may enable the design of more nutritious plants for the Third World where some people depend on only one crop for their diet and thus suffer from deficiency diseases. The discovery also has important implications for the oil industry, heralding the possibility of producing commercially useful amounts of oil in root crops.
- *IMF Embraces Dean's Theories on Economic Reform:* The IMF adopted CNR Dean Gordon Raussers' prescriptives for successful market economies in their new policy for credit and loans to developing countries. Future loans will be contingent upon a country's agreement to improve governance structures rather than just meeting set economic targets and implementing specific policies. Now the IMF identifies "promoting good governance in all its aspects, including ensuring the rule of law, improving the efficiency and accountability of the public sector and tackling corruption" as essential for sustained economic growth.
- *New Findings on Global Warming:* Professor Ronald Amundson, together with research collaborators at UC Irvine and UC Santa Barbara, recently reported that as global warming heats the Earth's surface, soils worldwide will release carbon dioxide into the air and intensify environmental problems. If the Earth's temperature rises even half a degree, forests soils alone will release as much carbon dioxide as 25% of that emitted annually from burning fossil fuels in cars, factories, and other sources. Because carbon dioxide molecules are spewed into the air as pollutants and blanket the Earth, the results could be global climate

change with temperatures climbing as much as 5 degrees Celsius by the middle of the next century.

- *Detoxifying Selenium:* Professor Bob Buchanan's lab team, along with colleagues in the Department of Molecular and Cell Biology and the Lawrence Berkeley National Laboratory, have discovered that nutrient conditions allow naturally occurring water and soil bacteria to convert toxic selenium in agricultural wastewater into non-toxic forms and to remove toxic nitrates from wastewater. The process is already being employed on a pilot scale for cleaning up agricultural runoff in San Joaquin Valley.
- *Defense against Frost Damage and Fire Blight:* Professor Steve Lindow found that a common bacteria species, *Pseudomonas fluorescens*, can be genetically modified to protect plants from both frost damage and fire blight, the major disease of pears and apples worldwide. Blightban, a commercial spray containing the microbes, is now used on about 100,000 acres of pears and apples worldwide. Years ago, Professor Lindow discovered that a bacterium, and later a single gene in the microbe, is what makes frost normally form on plant leaves. Using recombinant DNA techniques, he disabled this "ice gene," and coated potato seed pieces with the modified microbe before planting. The strategy worked and has since been developed commercially.

## ***Selection of Research Activity***

- *Tracking Cell Production:* A longtime challenge for scientists studying the evolution of disease has been the lack of a safe and effective way to track cell production in humans. Professor Marc Hellerstein of CNR's Department of Nutrition has developed a nontoxic and extremely accurate technique for tracking cell production from cell creation to cell death. His method uses mass spectrometry and Deuterium, a nonradioactive hydrogen isotope, to measure the production of helper T-lymphocytes or T-cells. The deuterium labels DNA in T-cells as they are produced and affords a safe, reliable count of the number of new T-cells generated. His discovery may revolutionize the monitoring and treatment of people with AIDS, cancers and other life-threatening illnesses.
- *Natural Solutions to Combating Breast Cancer:* Professor Leonard Bjeldanes and his colleagues have been exploring and testing the benefits Brassica vegetables such as Brussels sprouts, broccoli and cabbage have in protecting women against breast cancer a disease that now claims more than 40,000 deaths every year. A common key found in these plants is a dietary antiestrogen, indole-3-carbinol (I3C). Lab tests have demonstrated that the administration of I3C can reduce cancer in mammary glands of mice.
- *Bioprospecting and Investments in Conservation:* A recent paper by Dean Gordon Rausser and Arthur Small considers whether biodiversity prospecting—the search for new drugs, crops and other biotechnologies based on natural sources can generate significant financing for biodiversity conservation. Bringing the natural sciences into economic theory, they examine how information from such fields as ecology and systematics would affect where researchers choose to

search for genetic materials in rainforests, coral reefs, hot springs and other sites. Their results include an explicit statement of the relationship between the quality of this scientific information, and the amount that private firms would be willing to pay to conserve biodiverse areas. For areas that are especially promising, such as the hot springs in Yellowstone National Park, which contain the deepest known evolutionary divergences in the bacterial domain, these values could measure in the thousands of dollars per acre.

- The Economic Impact of Worker Inmate Programs:* George Goldman, Bruce McWilliams and Vijay Pradhan of the Department of Agriculture and Resource Economics recently released a report that is the first to document, in dollars, the contributions of worker-inmate programs to state and county economics. According to their study, the economic impact of the California Prison Industry Authority (PIA) on the state totals \$324.2 million in sales, \$113.9 million in income and 2,362 in jobs. Removing PIA from all the state and purchasing the same goods and services from the private sector would mean a loss of \$217.9 million in sales, \$62.3 million in income and 560 jobs. The report is just the latest in a series of landmark studies that Goldman has conducted to assess how particular programs and policies in California are affecting the lives and livelihoods of its citizens, particularly those in rural areas.
- Zinc Metabolism during Pregnancy and Breast-feeding:* Professor Janet King of CNR's Department of Nutrition and Toxicology recently made an important discovery on the mechanisms behind zinc's intake and absorption during pregnancy and breast-feeding. Though zinc absorption increases only slightly during pregnancy, it rises significantly during breast-feeding, indicating a metabolic adjustment in zinc use to meet the greater need for zinc in milk synthesis. She is currently using this discovery to help frame her research among women living in Rio de Janeiro whose intakes of zinc and calcium are lower than those of women in the United States. She believes that there is a threshold of adaptation in zinc absorption below which the health of the mother and baby are compromised. Zinc is vital to fetal growth and childhood development.
- Attacking Pierce's Disease in Riparian Habitats:* Vineyards in some of California's most prized growing regions are currently under heavy attack from Pierce's disease, a potentially disastrous insect-borne scourge that scorches grapevines and destroys harvest. Alexander Purcell, professor in the Insect Biology Division, has determined that insects, called blue-green sharpshooters, transmit the bacteria to plants. Together with Professor Joe McBride, chair of the Forest Science Division, Purcell is running experiments in Napa Valley to see if changes in riparian habitat can reduce populations of sharpshooters. Apparently, riparian vegetation of the so-called early successional species, such as blackberries and wild grape, serve as sharpshooter breeding areas, whereas later successional species, such as Valley Oak, California Bay and Hind's Black Walnut do not. In two Napa Valley riparian study areas, some of the early successional species are being removed and replaced with Hind's Black Walnut and other species that normally appear later in the life of such habitats. Though it will take five years

before the success of the strategy can be established, early signs indicate dramatic declines in sharpshooter populations.

- *Mapping the Changes in Wildlife Habitat Suitability Brought Upon by Timber Harvest:* Combining Professor Larry Davis' computer program for predicting forest structure under varying schedules and intensities of logging with a rich database on the habitat preferences of many California wildlife species, Professor Reginald Barrett is producing easily understood maps of how the extent of suitable habitat would change under different harvesting schedules.
- *Grazing and Water Quality:* Professor Barbara Allen-Diaz has begun a study with UC-Davis Extension Hydrologist Ken Tate to determine to what degree, if any, different grazing intensities affect the quality of water pouring out of oak woodlands watersheds at UC's Sierra Foothill Research and Extension Center near Marysville. Thus far, a smaller on-going research project found no measurable pollution in natural springs even when livestock graze right at the spring. So it is by no means certain that seasonal livestock grazing results in water pollution by the time water from streams and creeks pours out of the larger watershed.
- *A Laboratory for Studying Global Warming:* Professor John Harte's design of a "laboratory" that would demonstrate the effects of global warming on the living part of ecosystems has garnered wide praise. To create reliable biological data, he and his students installed infrared heaters above five 30-square-meter plots at the Rocky Mountain Biological Laboratory to increase their year-round temperature. Another five plots are serving as controls. This novel laboratory has enabled researchers to measure, among other phenomena, the changes in plant development, plant species composition, soil insect populations, and the capacity of soil microbes to consume the greenhouse gas methane. His contribution will have a long-lasting impact on our understanding of the consequences of global warming.

## **Community Outreach**

- *High School Students Find Insect Biology Fun:* "City Bugs" is a collaborative program between Oakland's Unified School District, CNR's Division of Insect Biology, Cooperative Extension in the Division of Agriculture and Natural Resources, and the "Interactive University" program. Through it, 10th-grade McClymonds students are learning to catch, identify, mount, and photograph insects, and digitize their images for inclusion in the "City Bugs" website. In a community plagued by poverty and violence, it is inspiring to see students appreciating lessons in biodiversity and motivated to study natural sciences at the college level.
- *Environmental Leadership Program Targets Urban Youth:* CNR faculty and graduate students give urban youth hands-on introduction to environmental science through six-week Summer Field Ecology Courses, offered through the Environmental Leadership Program. Through rigorous course work, participation in community projects and visits to sites ranging from wastewater treatment

plants to the forests of the Sierra Nevada, students learn about such issues as sustainability of natural resources, urban planning and environmental justice. For many of them, it is their first exposure to these disciplines as well as the wilderness.

- *Improving the Nutrition of California's Vietnamese Immigrants:* Professor Joanne Ikeda led a team of researchers to develop "Culturally Relevant Nutrition Education" for Vietnamese women eligible for the California Food Program for Women, Infants and Children. Financial limitations, language barriers and adapting to unfamiliar foods prepared in unfamiliar ways contribute to nutritional problems among Vietnamese immigrant women and their children. Upon their arrival, Vietnamese women typically increase their intake of saturated fat and decrease their intake of fiber. They also abandon breast-feeding. These can lead to health problems for them and their children. In piloting the nutrition program, bilingual Vietnamese Americans were hired to teach selected groups of immigrant women in five urban centers throughout California. These classes improved the overall nutritional quality of their diet. Now in its third year, the program has involved hundreds of women whose overall nutrition has improved as a result of the educational nutrition program.
- *Teaching Protection of Oak Woodlands in Vineyards:* To promote sustainable development and management of California vineyards, the Division of Agriculture and Natural Resources' Integrated Hardwood Range Management Program has developed a new extension curriculum for grape growers called "Vineyards in an Oak Landscape." The goal is to provide information to grape growers about the value of native vegetation and natural resources in and around the vineyard. The program has three areas of emphasis: (1) the benefits of biodiversity and native vegetation; (2) alternative strategies for preventing Pierce's disease and oak root fungus; and (3) managing vineyards as part of a larger ecosystem with attention to quality of soil, water and other natural resources in and around the vineyard.
- *Educating the Public on the Benefits of Genetic Engineering:* Despite the role of genetic engineering in creating improved agricultural products, such as those that are more disease-resistant, more nutritious and less allergenic, some people still do not understand the technology and are not poised to make wise decisions about its use. Dr. Peggy Lemaux has been at the forefront of providing nontechnical, jargon-free talks on genetic engineering, in the hope that the public's familiarity with the subject will allow them to make more informed decisions about its use. Besides mentoring students in these skills, she has presented her materials to crop consultants, news media, representatives in agribusiness and commodities boards, the Hispanic community and members of the European Union.

## UC Davis

- *Air Quality.* A particle accelerator developed by Tom Cahill, professor of atmospheric science, is being used to track air quality at more than 50 national parks, monuments and wilderness areas. The technology already has helped



reduce smog in the Grand Canyon and has been applied in California to measure air quality problems and find solutions to smog in the Lake Tahoe Basin and the Central Valley.

- *Mechanical Harvesters.* Through the decades, UC Davis researchers have revolutionized the sugar beet, tomato and strawberry industries by developing mechanical harvesters and improved varieties.
- *Tomatoes.* In 1959, the mechanical tomato harvester was developed at UC Davis and rapidly commercialized by several machinery manufacturers. In 1998, UC Davis researchers developed a commercial tomato yield monitor to make precision agriculture feasible for processing tomatoes. The technology uses satellite technology to identify factors that cause variability in crop yields.
- *Eliminating Toxins.* UC Davis scientists contributed research to the state on the health and environmental risks of the gasoline oxygenate known as MTBE. This led to California banning the use of MTBE as a gasoline additive.
- *Strawberries.* Nearly 90% of California's strawberries are now planted to UC-developed varieties. Today, research continues with groundbreaking work on soil solarization, a technique that promises to continue the Valley's top quality, high yielding strawberry production when a worldwide ban on the fumigant methyl bromide takes effect.
- *Water Policy.* UC Davis researchers have worked on state water supply models that meet the needs of agriculture, urban centers and environmental interests. In particular, they have introduced policy-makers to concepts of market pricing and pollution rights.
- *Wine and Grapes.* More than 95% of the grapes grown in the U.S., and many of those grown around the world, come from plants originated at UC Davis. Researchers also have cultivated phylloxera-resistant plants by using new rootstocks, benefiting growers who decide to replant.
- *Eliminating Hazardous Substances.* UC Davis' Superfund Basic Research Program is helping determine the extent of hazardous materials in groundwater, surface water and air as they shift away from toxic waste sites. Researchers are exploring new technologies to "remediate" or eliminate these substances and their potential health risks.
- *Restoring Native Grasslands.* The last decade has seen an enormous increase in using native plant species for restoration and "re-vegetation" projects. UC Davis research provides critically needed information on whether genetic pollution is a real risk when relocating different genetic stocks from their source of origin to different locales within California for use in restoration and re-vegetation.
- *Plant Disease.* UC Davis is developing dozens of ways to combat plant diseases, saving farmers nationwide billions of dollars in crop losses each year, through a biotechnology research center established in 1991. One major discovery spawned a whole new field of molecular biology technology that allows viral diseases to be controlled in plants. Other center discoveries have created the genetic engineering of disease-resistant crops.

- *Rice Genomics.* Researcher Pam Ronald discovered a way to genetically alter rice crops—the food staple for much of the world—to resist bacterial disease. Her 1995 discovery boosted global rice productivity and decreased agricultural chemical use, particularly in Third World nations.
- *Global Warming.* UC Davis researchers are examining global warming's anticipated impacts on agriculture, biodiversity, and air and water quality in California in the century ahead. Reviewing the work of the United Nations Intergovernmental Panel on Climate Change, scientists agree the atmospheric concentrations of greenhouse gases and particles to increase, and that this, in turn, is leading to global climate change.
- *World Hunger.* Also aiding the cause of world hunger, UC Davis researchers are developing methods of predicting famine and drought at the Global Livestock Collaborative Research Support program. The program aims to boost livestock production in politically and ecologically fragile Third World nations, ultimately providing the nutrition crucial to children's survival.
- *Pest Control.* Pioneering work in the fields of entomology and toxicology has led to new methods of pest control in U.S. agriculture. Environmental toxicologist Bruce Hammock is working to discover natural viruses that can act as pesticides, find less expensive methods to detect pesticide exposure in human blood and urine, and learn the potential risk to human life from pesticide chemicals.
- *Breast Milk.* Research conducted by nutrition professor Kay Dewey is leading to new growth standards for breast-fed babies born in the U.S. Earlier infant growth charts have not reflected the true growth rate for breast-fed babies, leading many doctors to interpret the infants' progress as slow. Dewey's findings will be critical to early medical treatment and diagnosis of infants.
- *Food Storage.* Plant physiologist Alan Bennett developed an extensive portfolio of properties for handling and storing fruit crops after harvest. His research created varieties of fruit that will ripen after being picked, so they are fresh when consumers buy them. This patented research lengthened the shelf life of numerous fruits.
- *Safer Meat.* More than 90% of California cattle are raised on a quality assurance program developed at UC Davis, an important fact in the wake of recent outbreaks in Europe of Mad Cow Disease and Foot and Mouth Disease. The quality assurance program for dairies is the first of its kind in the national and is being used as a model in other states.
- *Rice Straw Burning.* UC Davis scientists have found that foraging waterfowl in winter-flooded rice fields helped control weeds and increase the decomposition of rice straw from the previous season's crop. Thus, wildlife and agriculture can co-exist and be mutually beneficial. This makes highly polluting rice straw burning—soon to be banned—less necessary.



## UC Riverside

### ***Pest and Disease Sciences***

- *Bees & Spiders.* UC Riverside scientists led by Dr. P. Kirk Visscher study the behaviors and biology of Africanized honeybees—so-called “killer bees.” They’ve tracked the movement of Africanized bees since their arrival in California in 1994 and are learning more about the bees’ individual and group behaviors in comparison to European bees. UC Riverside scientists also provide government agencies such as the USDA Forest Service and the public with strategies for removing hives, preventing attacks, and treating stings. Venomous spiders are also a focus of Dr. Visscher’s lab. Staff Researcher Rick Vetter has published articles in medical journals and presented findings at scientific conferences to debunk the myth that brown recluses are responsible for numerous biting wounds across the United States in a year. He has shown that brown recluses are blamed for bites and injuries occurring in regions where the spiders have never been known to live and has explained that many other diseases and insects can cause the type of wounds doctors are attributing to brown recluses, causes that can have life-threatening consequences if mistreated.
- *Eucalyptus Pests.* Eucalyptus trees—a popular California landscape tree used throughout the state by homeowners, municipalities, and businesses—began in 1985 to suffer serious attacks from the invasive longhorned borer. Within a short period of time, thousands of eucalyptus and other shade trees had died in the state. Entomologists Timothy Paine, Jocelyn Millar, and Robert Luck developed the program to control longhorned borer populations by importing and releasing a parasitic wasp from Australia that attacked the borers’ eggs. By 1999, the wasps had killed 90% of the borer in the regions of northern and southern California where they were released.
- *Xylella fastidiosa and Pierce’s Disease.* Years before the grapevine pathogen Pierce’s Disease became a costly problem in California, UC Riverside scientists were investigating the nature and possible control of the bacterium at the root of Pierce’s Disease, *Xylella fastidiosa*. This pathogen causes the build up of a gummy substance that blocks water transport through plants and leads to their death within a year or two. No cure exists for infected plants. Scientists have identified numerous grasses, fruit and nut trees, and crops harmed by the pathogen. Major California plants include oleander, almonds, and alfalfa. Current research takes many forms, from studying the epidemiology of *Xylella* diseases, to elucidating the exact nature of the pathogen’s interaction with insect vectors and with plants, to doing functional genomic studies of *Xylella fastidiosa* in various plants with the ultimate aim of identifying genetic resistance mechanisms and disease-resistant varieties.
- *Avocado Enemies.* Two exotic pests—avocado thrips and perseas mites—caused the state’s \$362 million avocado industry \$6 million in losses from 1997 to 2000. Growers in the San Diego region once again sprayed in their orchards to minimize foliage and fruit damage after more than four decades of being pesticide-free. UC Riverside Biological Control Specialist Mark Hoddle led efforts

to identify and classify the avocado thrips—previously unknown in the United States—and to determine the natural enemies of both pests. As a result, Dr. Hoddle developed biological control programs that use predator mites to control perseia mites, giving growers an effective chemical-free control method. Dr. Hoddle also traveled to Latin America to identify black-hunter thrips as natural enemies of avocado thrips and is now evaluating this predator’s effectiveness.

- *IPM Programs for Commodities.* Entomologist Nick Toscano was the first Cooperative Extension specialist to introduce commodity-wide integrated pest management (IPM) programs in the state when he developed broad-based strategies to control pests and diseases of tomatoes and iceberg lettuce in the early 1990s. The IPM programs determine optimal planting times and crop rotation cycles, identify disease-resistant varieties, utilize baited traps, and substitute natural predators and plant- or bacterial-derived substances for pesticides. A California State Legislature commendation noted that Dr. Toscano’s work reduced the use of pesticides in tomato fields by 50% in San Diego County and by 80% in Tulare County.

## ***Plant Studies***

- *Turfgrass.* Extension Horticultural Specialist Vic Gibeault and Agricultural Operations Superintendent Steve Cockerham have developed new varieties of turfgrass to withstand insect and nematode pests and provide superior drought-resistance. One new zoysiagrass variety developed that is now commercially available, DeAnza, was planted in the Bank One Dome in Phoenix. A Turfgrass Pilot Program in the Palm Springs region also has been launched to evaluate dozens of varieties to determine which offer the best qualities for the area’s resorts.
- *Citrus Breeding.* Three new varieties of mandarins (or tangerines) were released in June 2002, giving growers and consumers new options. Each of the three new varieties has different characteristics, but all share the attractive quality of few seeds. In 1999, UC Riverside released another sweet-tasting mandarin, the Gold Nugget, which can extend growers’ seasons into late May or early June. UC Riverside is one of the few institutions in the nation with an organized citrus breeding program. Today’s work, aided by genetic and molecular techniques, builds on a program begun in the 1940s that has brought the state’s \$677 million citrus industry the popular Encore and Pixie mandarin varieties and Oroblanco and Melogold grapefruit hybrids.
- *Improving A Nutritious Food Source.* A team of UC Riverside scientists including Professor of Plant Physiology Anthony Hall and Professor of Genetics Timothy Close identified the dehydrin gene that gives blackeye pea (cowpea) tolerance to chill temperatures during seed emergence. Blackeye pea is an excellent and affordable source of protein, and a substantial part of the food supply in drought-ridden areas of the world. New varieties are being bred that will increase the crop’s ability to withstand chill and allow growers to plant earlier in the spring. As part a larger breeding effort, Dr. Hall and Professor of Nematology Philip Roberts developed California Blackeye No. 27, which offers resistance to

root-knot nematode species and Fusarium wilt disease, as well as increased ability to withstand heat during flowering. Work now focuses on combining heat-tolerance traits with chill-tolerance traits.

## ***Environmental Sciences***

- *New Toxic Clean-up Methods.* Professor of Soil Microbiology and Biochemistry William Frankenberger has developed patented technologies utilizing fungi and other microbial agents that naturally detoxify water contaminated with selenium, perchlorate, and nitrate. His early research was key to providing the U.S. government with a new paradigm for dealing with polluted sites, including Superfund sites. The Kesterson Reservoir in the San Joaquin Valley was one such site. This site, used for agricultural drainage for nearby cotton and alfalfa farms, had become toxic by 1985 due to the build-up of pesticides and fertilizers. Waterfowl deformities and die-offs resulted. The government clean-up plan was to create a large landfill to bury the site, at a cost of \$48 million. Knowing that the plan offered no lasting solution since landfills deprive people and wildlife of the natural resource and because landfill barriers can become permeable in time, Dr. Frankenberger launched a national campaign to inform the press, government officials, environmental organizations, and Congressmen of the availability of bioremediation alternatives. Although the Bureau of Reclamation did fill the site in 1989, Dr. Frankenberger's research halted the landfill for a time and brought national attention and federal funding to bioremediation research. Federal agencies today have largely abandoned "excavate and bury" strategies in favor of broader-based approaches that utilize regional irrigation and drainage management plans together with remediation techniques, including Dr. Frankenberger's technology.
- *Methyl Bromide Alternatives.* Researchers at UC Riverside are developing alternatives to methyl bromide, a widely used agricultural fumigant since the 1930s that is subject to an EPA phase-out and eventual ban by 2005. The cost to U.S. agriculture of the loss of the fumigant is estimated by various agencies at between \$430 million to \$1.5 billion a year. Professor of Plant Pathology James Sims has patented and licensed an ozone-friendly methyl iodide formula and application method that has been termed a "highly efficacious alternative" for a wide variety of crops by the National Center for Food and Agricultural Policy. Trials are ongoing by a Japanese chemical company that licensed the formula and has control of iodide supplies. Other scientists, including Dr. Scott Yates of the USDA Salinity Lab and Assistant Professor of Environmental Sciences Jay Gan, explore the effectiveness of tarps, known as Virtually Impermeable Barriers, used in combination with compounds that degrade soil fumigants. Early findings have indicated that barriers and thiosulfates can reduce the emissions of ozone-depleting chemicals by 90%.
- *Recycling Water.* As the world's population grows and water resources remain limited, reclaiming used water supplies becomes more urgent. UC Riverside environmental scientists are dealing with this issue in numerous ways. Professor of Agricultural Engineering Andrew Chang leads efforts to develop international

guidelines for the reuse of waste water and sewage water for irrigation supplies, developing reports on current practices and recommended safety policies for the World Health Organization since 1994. Associate Professor and Biosystems Engineer David Crohn is part of the UC Waste Management Group that, among other things, is involved in constructing wetlands for treatment of municipal wastewater. Professor of Environmental Microbiology Marylynn Yates, Associate Executive Vice Chancellor, is also a national expert on safeguarding public water supplies, including recycled supplies, and served on a National Research Council committee making recommendations for improving the National Water Quality Assessment Program.

- *A Unique Conservation Plan.* Environmental scientists and conservationists at UC Riverside are part of a unique long-term planning process, the Multi-Species Habitat Conservation Plan (MSHCP), which provides a regional strategy for preserving the habitats of more than 160 plant and animal species in 500,000 acres of western Riverside County. The objective of the plan is to give local and state officials a comprehensive and long-term method for species conservation that they can incorporate into a larger integrated strategy for the region's needs, including housing, transportation, and commercial development. The goal is to replace current practices of evaluating each construction project and each species on an individual basis. UC Riverside scientists, including Associate Director of the Center for Conservation Biology Thomas Scott, provide the scientific data about species and habitats upon which the conservation plan is formulated and serve on the MSHCP advisory panel.
- *Chemical Movement Modeling.* Distinguished Professor of Soil Physics William Jury developed a mathematical modeling technique in 1982 now commonly accepted that indicates how organic and inorganic compounds will disperse through agricultural fields and whether they will contaminate groundwater supplies. Called the convective lognormal transfer function—or the Jury transfer function—the model “revolutionized the prediction of fertilizer and contaminant transport,” according to the citation for Dr. Jury’s election to the National Academy of Sciences. He also developed a model, now used in software packages by industry and government, that can predict the potential for soil, water, or air contamination by chemical solutions based only on the chemical composition descriptions used to register products.

### **Fundamental Research**

- *Genomics and Nematodes.* *C. elegans* has been a model organism for genetic and molecular biology research for the past 40 years. The nematode species was the first multicellular organism for which the entire sequenced genome was released publicly (1998). Worldwide scientists use the organism to investigate numerous issues related to human health, including neurological disorders, the development of the nervous system, regulation of metabolism, and the molecular processes involved in aging. At UC Riverside, nematologists including James Baldwin and Paul De Lay are studying *C. elegans* and other nematode species to explore such issues as the role of selection in evolution, adaptation to

various environments, the signaling function of genes involved in disease resistance, and the evolution of parasitic behaviors and mitochondrial DNA.

- *Pathogens and Cell Biology.* Research at UC Riverside to understand the nature of plant pathogens has shed light on the molecular and genetic processes involved in disease and resistance mechanisms. In work recognized by the National Academy of Sciences, the late Noel Keen pioneered the study of phytoalexins in disease resistance and coined the word “elicitor” to describe the pathogen chemicals that trigger resistance responses in plants. He was the first to clone and characterize avirulence genes. His work with pectate lyase enzymes, the active genes causing soft-rot diseases, led to the identification of a novel protein structure, the parallel  $\beta$ -helix, characterized and purified by Dr. Keen and UC Riverside biochemists. In a recent breakthrough published in *Science*, Assistant Professor Shou-Wei Ding has explained the mechanisms by which a plant pathogen, flock house virus, both initiates and is a target of RNA silencing in *Drosophila* host cells. The findings established RNA silencing as an adaptive antiviral defense mechanism in animal cells and provides the foundation for future work that could lead to pharmaceuticals to inhibit viruses.
- *Evolutionary Studies.* Studies in plant evolutionary processes are providing new insight into molecular biology and genetics. Michael Clegg, Foreign Secretary of the National Academy of Sciences and Director of the UC Riverside Genomics Institute, has long been recognized as one of the world’s top researchers studying the mechanisms that regulate gene and gene family evolution, focusing specifically on the alcohol dehydrogenase gene family, which plays a role in anaerobic stress responses, and the chalcone synthase family, which is involved in the biosynthesis processes regulating flower pigmentation, pathogen resistance, and UV protection. As part of his research, Dr. Clegg and colleagues were the first to recover and decode genes from a 20-million-year-old magnolia leaf and utilize the genetic data to analyze the evolution of plant gene families.
- *Insects and Molecular Biology.* Insect species are often used as model organisms by researchers engaged in many different research activities. At UC Riverside, entomologist and developmental biologist Alexander Raikhel uses mosquitoes to advance understanding of embryology. His most significant contributions have involved studies of the endocytosis of yolk proteins in mosquitoes. His work has included identifying and cloning the first insect vitellogenin receptor. He was part of the team that developed transgenic mosquitoes with altered immunity systems as a step toward controlling the malaria pathogen. Dr. Peter Atkinson, Associate Director of the UC Riverside Genomics Institute, has developed a transposable DNA element, known as the *Hermes* element, as a means of introducing engineered genes into various insects that transmit disease, including the mosquito species that vectors the West Nile virus.

## **Examples of Significant Research Achievements**

- In 1927, entomologists introduced two wasps from Australia as natural enemies of a major citrus pest, the citrophilus mealybug. Growers in Orange County were

saved \$1 million in annual losses. This event is considered pivotal in establishing biological control as a practical means of reducing pest populations.

- In the 1940s, the citrus tristeza virus had destroyed 3 million trees in California when Citrus Experiment Station researchers identified the Troyer citrange rootstock as offering vastly superior resistance. The industry was saved from devastation by regrowing their orchards on the disease-resistant rootstock.
- In 1944, the Air Pollution Research Center published its breakthrough findings that smog damages plants and decreases crop yields.
- In 1963, after years of research and field evaluation, plant physiologist Charles Coggins registered gibberellic acid for use in California citrus groves to delay fruit maturation. He proved that application of the substance allows fruit to remain on citrus trees for extended periods. The ultimate result of his work with growth regulators, which continued through the 1980s, was the extension of the citrus-growing season in California to nine months from four months. Some have called this breakthrough the single most significant development ever to benefit the nation's \$2.3 billion citrus industry.
- In 1967, biochemist and molecular biologist Anthony Norman was one of two U.S. scientists working independently who isolated and described the chemical nature of the substance that the public knew as vitamin D, but is, in fact, a steroid hormone. He would later explain the important role the hormone plays in human metabolism. Several life-saving drug treatments have been developed as a result of research by the Norman lab.
- In 1980, UC Riverside released its first patented citrus variety, the Oroblanco grapefruit. Since then, the citrus breeding program has released the Melogold grapefruit, the Gold Nugget mandarin (or tangerine), and three new tangerine varieties that have yet to be given trademark names. Each new variety gives growers advantages and offers consumers more choices.
- In 1982, soil physicist William Jury developed a mathematical modeling technique to indicate how organic and inorganic compounds disperse through agricultural soils and move to groundwater supplies. The convective lognormal transfer function—also known as the Jury transfer function—became the standard for predicting the movement of fertilizers and contaminants through soils.
- In 1985-89, soil microbiologist William Frankenberger launched a national media and Congressional awareness campaign to prove that fungi and microbial agents can detoxify polluted soil and water bodies. He acted in response to government plans to create a landfill to cover a Superfund site in the San Joaquin Valley, the Kesterson Reservoir. He argued that "excavate and bury" strategies not only deprive people and wildlife of a natural resource but offer no lasting solution to contamination since landfill barriers will eventually become permeable. He is credited with proving the efficacy of detoxification technologies, as well as introducing policy-makers and legislators to remediation alternatives.



- In 1989, plant pathologist Noel Keen and Biochemist Fran Jurnak identify a previously unknown protein structure, the parallel beta-helix, as part of Dr. Keen's pioneering work in plant pathology that included identifying the pectate lyase enzymes causing some plant diseases.
- In 1989, geophysicist Harry Green II and graduate student Pamela Burnley provide the first explanation for the phenomenon known as "deep-focus earthquakes," those occurring 300 kilometers or more beneath the earth's surface. Known to have existed since the 1920s, deep earthquakes were not understood until Dr. Green and Ms. Burnley explained how minerals at great depths can become unstable even though they are not subjected to friction as occurs on the earth's surface.
- In 1990, plant geneticist Michael Clegg led a research group that was the first to recover and decode ancient plant DNA, genetic material from a magnolia leaf 20 million years old. Extracting the genetic data allowed scientists to study evolutionary changes in plant DNA. The project involved the novel application of technology now standard in genomics research, polymerase chain reaction (PCR), which allows for the quick replication of genes for study.
- In 1991, UC Riverside entomologists released a stingless wasp, *Encarsia partenopea*, as the key element in a biological control program of the ash whitefly, an urban and agricultural pest that had caused \$2 billion in crop damages since 1988. A massive release program of 130,000 wasps reduced ash whitefly populations by 10,000 fold, leading the USDA to call the project one of the most successful biological control programs ever.
- In 1993-95, UC Riverside high-energy physicists were part of the international research effort that provided the world with evidence of the top quark, a fundamental particle theorized to have existed since the 1960s but never before observed.
- In 1996, UC Riverside entomologists and plant pathologists conducted an assessment of the likelihood that wheat grown in the Imperial and Palo Verde valleys of Southern California would lead to the spread of Karnal bunt disease. A national outbreak of the fungal-produced disease had caused the USDA to order crop destructions and quarantines in several states. The research by UC Riverside scientists proved that wheat grown in the state was extremely unlikely to spread the disease. As a result, the USDA lifted the quarantine and restrictions. Growers could have lost as much as \$1.2 billion had the quarantine remained in effect.
- In 2002, chemist Guy Bertrand and his research team are the first to create a stable singlet diradical, a development announced worldwide. The unique compound could someday lead to a new generation of non-metallic magnetic devices for medical imaging or electronics.





## K. Patient-Care Data Sources

The data used in the patient care analysis is from the following State of California Office of Statewide Health Planning and Development (OSHPD) data reports:

### **OSHPD Annual Hospital Utilization Reports, 2000**

- The report consists of a raw database and a pivot table for generating data profiles according to user-defined queries.
- *Data Period*: Calendar Year 2000, Jan. 1, 2000 to Dec. 31, 2000.
- *Raw Data Parameters*: All California hospitals, except state hospitals and hospitals that did not report any inpatient utilization. Note that the parameters for the various analyses of the raw data depend on the criteria stated. Refer to footnotes in the relevant sections of the document and in appendices L–O.

### **OSHPD Hospital Annual Financial Report, FY 1995 and FY 2000**

- The report consists of a raw database and a pivot table for generating data profiles according to user-defined queries.
- *Data Period(s)*: Hospital FY 2000 financial data collected by the office through Dec. 31, 2000 (reporting period: June 30, 2000 through Dec. 31, 2000). However, financial data beginning and end dates vary, corresponding with each hospital's fiscal year. UC's FY 2000 cycle is July 1, 1999 to June 30, 2000.
- *Raw Data Parameters*: All California hospitals except those that did not report. Note that the parameters for the various analyses of the raw data depend on the criteria stated. Refer to footnotes in the relevant sections of the document and in appendices L–O.
- *Data Profiles (query reports)*: The data profiles exclude queries for Kaiser, State, Shriners, Long Term Care (LTC) Emphasis and PHFs (Psychiatric Hospital Facilities).



## L. Regional Available Beds Statistics, 2000

Source: OSPHD's Hospital Annual Financial Data Report, FY 2000. See Appendix K.

**Figure L-1.**  
**Golden Empire Health Services Area Available Beds**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH CARE SYSTEM	AVAILABLE BEDS	SHARE OF TOTAL AVAILABLE BEDS
BARTON MEMORIAL HOSPITAL	EL DORADO	N/A	118	2.60%
EL DORADO COUNTY MENTAL HEALTH-PHF	EL DORADO	N/A	10	0.22%
FREMONT HOSPITAL - YUBA CITY	SUTTER	N/A	192	4.23%
HERITAGE OAKS HOSPITAL	SACRAMENTO	BEHAVIORAL HEALTHCARE CORP	76	1.67%
KAISER FDN HOSP - SACRAMENTO	SACRAMENTO	KAISER FOUNDATION	450	9.91%
KAISER FDN HOSP - SOUTH SACRAMENTO	SACRAMENTO	KAISER FOUNDATION	179	3.94%
MARSHALL HOSPITAL	EL DORADO	N/A	103	2.27%
MERCY GENERAL HOSPITAL	SACRAMENTO	CATHOLIC HEALTHCARE WEST	386	8.50%
MERCY HOSPITAL - FOLSOM	SACRAMENTO	CATHOLIC HEALTHCARE WEST	95	2.09%
MERCY SAN JUAN HOSPITAL	SACRAMENTO	CATHOLIC HEALTHCARE WEST	322	7.09%
METHODIST HOSPITAL OF SACRAMENTO	SACRAMENTO	CATHOLIC HEALTHCARE WEST	333	7.33%
RIDEOUT MEMORIAL HOSPITAL	YUBA	N/A	142	3.13%
SACRAMENTO MENTAL HLTH TREATMENT CTR-PHF	SACRAMENTO	N/A	82	1.81%
SHRINERS HOSPITAL - NORTHERN CALIF	SACRAMENTO	N/A	60	1.32%
SIERRA NEVADA MEMORIAL HOSPITAL	NEVADA	CATHOLIC HEALTHCARE WEST	121	2.67%
SIERRA VALLEY DISTRICT HOSPITAL	SIERRA	N/A	40	0.88%
SIERRA VISTA HOSPITAL	SACRAMENTO	BEHAVIORAL HEALTHCARE CORP	72	1.59%
SUTTER AUBURN FAITH HOSPITAL	PLACER	SUTTER HEALTH	102	2.25%
SUTTER CENTER FOR PSYCHIATRY	SACRAMENTO	SUTTER HEALTH	69	1.52%
SUTTER DAVIS HOSPITAL	YOLO	SUTTER HEALTH	48	1.06%
SUTTER MEDICAL CENTER - SACRAMENTO	SACRAMENTO	SUTTER HEALTH	661	14.56%
SUTTER ROSEVILLE MEDICAL CENTER	PLACER	SUTTER HEALTH	172	3.79%
SUTTER-YUBA - PHF	SUTTER	N/A	16	0.35%
TAHOE FOREST HOSPITAL	NEVADA	N/A	72	1.59%
UC DAVIS	SACRAMENTO	UNIVERSITY OF CALIFORNIA	471	10.37%
VENCOR HOSPITAL - SACRAMENTO	SACRAMENTO	VENCOR INC	37	0.81%
WOODLAND MEMORIAL HOSPITAL	YOLO	CATHOLIC HEALTHCARE WEST	111	2.44%
		<b>TOTAL</b>	<b>4,540</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>103</b>	<b>2.27%</b>

**Figure L-2.  
West Bay Health Services Area Available Beds**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH CARE SYSTEM	AVAILABLE BEDS	SHARE OF TOTAL AVAILABLE BEDS
CALIFORNIA PACIFIC MEDICAL CENTER	SAN FRANCISCO	SUTTER HEALTH	714	10.34%
CHINESE HOSPITAL	SAN FRANCISCO	N/A	59	0.85%
HEBREW HOME FOR THE AGED DISABLED	SAN FRANCISCO	N/A	460	6.66%
KAISER FDN HOSP - GEARY (S.F.)	SAN FRANCISCO	KAISER FOUNDATION	279	4.04%
KAISER FDN HOSP - REDWOOD CITY	SAN MATEO	KAISER FOUNDATION	206	2.98%
KAISER FDN HOSP - SAN RAFAEL	MARIN	KAISER FOUNDATION	120	1.74%
KAISER FDN HOSP - SOUTH SAN FRANCISCO	SAN MATEO	KAISER FOUNDATION	98	1.42%
KENTFIELD REHABILITATION CENTER	MARIN	SUN HEALTHCARE GROUP INC.	60	0.87%
LAGUNA HONDA HOSPITAL & REHAB CENTER	SAN FRANCISCO	N/A	1,147	16.61%
MARIN GENERAL HOSPITAL	MARIN	SUTTER HEALTH	218	3.16%
MENLO PARK SURGICAL HOSPITAL	SAN MATEO	N/A	16	0.23%
MILLS-PENINSULA MEDICAL CENTER	SAN MATEO	SUTTER HEALTH	374	5.42%
NOVATO COMMUNITY HOSPITAL	MARIN	SUTTER HEALTH	72	1.04%
PACIFIC COAST HOSPITAL	SAN FRANCISCO	N/A	28	0.41%
SAN FRANCISCO GENERAL HOSP MED CTR	SAN FRANCISCO	N/A	583	8.44%
SAN MATEO GENERAL HOSPITAL	SAN MATEO	N/A	213	3.09%
SEQUOIA HOSPITAL	SAN MATEO	CATHOLIC HEALTHCARE WEST	417	6.04%
SETON MEDICAL CENTER	SAN MATEO	CATHOLIC HEALTHCARE WEST	269	3.90%
SETON MEDICAL CENTER - COASTSIDE	SAN MATEO	CATHOLIC HEALTHCARE WEST	121	1.75%
ST. FRANCIS MEMORIAL HOSPITAL	SAN FRANCISCO	CATHOLIC HEALTHCARE WEST	325	4.71%
ST. LUKE'S HOSPITAL	SAN FRANCISCO	N/A	248	3.59%
ST. MARY'S MEDICAL CENTER SAN FRANCISCO	SAN FRANCISCO	CATHOLIC HEALTHCARE WEST	348	5.04%
UC SAN FRANCISCO (**Includes UCSF's 3 hospital locations)	SAN FRANCISCO	UNIVERSITY OF CALIFORNIA	529	7.66%
		<b>TOTAL</b>	<b>6,904</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>248</b>	<b>3.59%</b>

**Figure L-3.**  
**Los Angeles County Health Services Area Available Beds**

*(excludes the two state hospitals in this Health Services Area: Lanterman State Hospital and Developmental Center; Metropolitan State Hospital)*

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH CARE SYSTEM	AVAILABLE BEDS	SHARE OF TOTAL AVAILABLE BEDS
ALHAMBRA HOSPITAL - ALHAMBRA	LOS ANGELES	N/A	144	0.61%
AMERICAN RECOVERY CENTER	LOS ANGELES	N/A	156	0.66%
ANTELOPE VALLEY HOSPITAL MEDICAL CTR	LOS ANGELES	N/A	342	1.45%
AURORA CHARTER OAK	LOS ANGELES	N/A	95	0.40%
AVALON MUNICIPAL HOSPITAL & CLINIC	LOS ANGELES	N/A	12	0.05%
BARLOW HOSPITAL	LOS ANGELES	N/A	61	0.26%
BELLFLOWER MEDICAL CENTER	LOS ANGELES	PACIFIC HEALTH CORPORATION	162	0.69%
BEVERLY HOSPITAL	LOS ANGELES	N/A	217	0.92%
BHC ALHAMBRA HOSPITAL	LOS ANGELES	BEHAVIORAL HEALTHCARE CORP	85	0.36%
CALIFORNIA HOSPITAL MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	313	1.33%
CEDARS-SINAI MEDICAL CENTER	LOS ANGELES	N/A	851	3.62%
CHARTER BHS - COVINA	LOS ANGELES	N/A	95	0.40%
CHILDREN'S HOSPITAL OF LOS ANGELES	LOS ANGELES	N/A	314	1.33%
CITRUS VALLEY MEDICAL CENTER-QV CAMPUS	LOS ANGELES	N/A	539	2.29%
CITY OF ANGELS MEDICAL CENTER	LOS ANGELES	N/A	168	0.71%
CITY OF HOPE NATIONAL MEDICAL CENTER	LOS ANGELES	N/A	153	0.65%
COAST PLAZA DOCTORS HOSPITAL	LOS ANGELES	N/A	123	0.52%
COLLEGE HOSPITAL	LOS ANGELES	N/A	125	0.53%
COLUMBIA LAS ENCINAS HOSPITAL	LOS ANGELES	COLUMBIA/HCA HEALTHCARE CORP	136	0.58%
COMMUNITY HOSPITAL OF GARDENA	LOS ANGELES	N/A	58	0.25%
DANIEL FREEMAN MARINA HOSPITAL	LOS ANGELES	N/A	153	0.65%
DANIEL FREEMAN MEMORIAL HOSPITAL	LOS ANGELES	N/A	345	1.47%
DEL AMO HOSPITAL	LOS ANGELES	N/A	166	0.71%
DOCTORS HOSPITAL OF WEST COVINA	LOS ANGELES	N/A	51	0.22%
DOWNEY COMMUNITY HOSPITAL	LOS ANGELES	N/A	186	0.79%
EARL & LORRAINE MILLER CHILDRENS HOSP	LOS ANGELES	N/A	171	0.73%
EAST LOS ANGELES DOCTOR'S HOSPITAL	LOS ANGELES	N/A	127	0.54%
ENCINO TARZANA RGNL MC - ENCINO	LOS ANGELES	TENET HEALTHCARE CORP	151	0.64%
FOOTHILL PRESBYTERIAN HOSPITAL	LOS ANGELES	N/A	106	0.45%
GATEWAYS HOSPITAL AND MENTAL HEALTH CTR	LOS ANGELES	N/A	55	0.23%
GLENDALE ADVENTIST MEDICAL CENTER	LOS ANGELES	ADVENTIST HEALTH	365	1.55%
GLENDALE MEMORIAL HOSPITAL & HEALTH CTR	LOS ANGELES	CATHOLIC HEALTHCARE WEST	334	1.42%
GOOD SAMARITAN HOSPITAL	LOS ANGELES	N/A	374	1.59%
GRANADA HILLS COMMUNITY HOSPITAL	LOS ANGELES	N/A	153	0.65%
HENRY MAYO NEWHALL MEMORIAL HOSPITAL	LOS ANGELES	N/A	217	0.92%
HUNTINGTON EAST VALLEY HOSPITAL	LOS ANGELES	N/A	118	0.50%

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH CARE SYSTEM	AVAILABLE BEDS	SHARE OF TOTAL AVAILABLE BEDS
HUNTINGTON MEMORIAL HOSPITAL	LOS ANGELES	N/A	522	2.22%
KAISER FDN HOSP - BELLFLOWER	LOS ANGELES	KAISER FOUNDATION	271	1.15%
KAISER FDN HOSP - HARBOR CITY	LOS ANGELES	KAISER FOUNDATION	193	0.82%
KAISER FDN HOSP - PANORAMA CITY	LOS ANGELES	KAISER FOUNDATION	192	0.82%
KAISER FDN HOSP - SUNSET	LOS ANGELES	KAISER FOUNDATION	547	2.32%
KAISER FDN HOSP - WEST LA	LOS ANGELES	KAISER FOUNDATION	212	0.90%
KAISER FDN HOSP - WOODLAND HILLS	LOS ANGELES	KAISER FOUNDATION	154	0.65%
KAISER FND HOSP - BALDWIN PARK	LOS ANGELES	KAISER FOUNDATION	163	0.69%
KAISER FOUNDATION SOUTHERN REGION	LOS ANGELES	KAISER FOUNDATION	0	0.00%
KEDREN COMMUNITY MENTAL HEALTH CENTER	LOS ANGELES	N/A	48	0.20%
LA CASA PSYCHIATRIC HEALTH FACILITY	LOS ANGELES	N/A	16	0.07%
LAC/HARBOR+UCLA MEDICAL CTR	LOS ANGELES	COUNTY OF LOS ANGELES	459	1.95%
LAC/HIGH DESERT HOSPITAL	LOS ANGELES	COUNTY OF LOS ANGELES	120	0.51%
LAC/MARTIN LUTHER KING JR/DREW MED CTR	LOS ANGELES	COUNTY OF LOS ANGELES	374	1.59%
LAC/OLIVE VIEW MEDICAL CENTER	LOS ANGELES	COUNTY OF LOS ANGELES	261	1.11%
LAC/RANCHO LOS AMIGOS NATIONAL REHAB CTR	LOS ANGELES	COUNTY OF LOS ANGELES	270	1.15%
LAC/USC MEDICAL CENTER	LOS ANGELES	COUNTY OF LOS ANGELES	986	4.19%
LANCASTER COMMUNITY HOSPITAL	LOS ANGELES	N/A	117	0.50%
LITTLE COMPANY OF MARY HOSPITAL	LOS ANGELES	N/A	393	1.67%
LONG BEACH COMMUNITY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	261	1.11%
LONG BEACH MEMORIAL MEDICAL CENTER	LOS ANGELES	MEMORIAL HEALTH SERVICES	570	2.42%
LOS ANGELES COMMUNITY HOSPITAL	LOS ANGELES	N/A	180	0.76%
LOS ANGELES METROPOLITAN MEDICAL CENTER	LOS ANGELES	PACIFIC HEALTH CORPORATION	201	0.85%
MEMORIAL HOSPITAL OF GARDENA	LOS ANGELES	N/A	172	0.73%
METHODIST HOSPITAL OF SOUTHERN CAL	LOS ANGELES	N/A	440	1.87%
MISSION COMMUNITY HOSPITAL - PANORAMA	LOS ANGELES	N/A	152	0.65%
MONROVIA COMMUNITY HOSPITAL	LOS ANGELES	N/A	49	0.21%
MOTION PICTURE & TELEVISION HOSPITAL	LOS ANGELES	N/A	299	1.27%
NORTHRIDGE HOSPITAL MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	414	1.76%
NORTHRIDGE HOSPITAL MEDICAL CTR-SHERMAN	LOS ANGELES	CATHOLIC HEALTHCARE WEST	209	0.89%
ORTHOPAEDIC HOSPITAL	LOS ANGELES	N/A	112	0.48%
PACIFIC ALLIANCE MEDICAL CENTER	LOS ANGELES	N/A	138	0.59%
PACIFIC HOSPITAL OF LONG BEACH	LOS ANGELES	N/A	146	0.62%
PACIFICA HOSPITAL OF THE VALLEY	LOS ANGELES	N/A	240	1.02%
PINE GROVE HOSPITAL	LOS ANGELES	N/A	79	0.34%
POMONA VALLEY HOSPITAL MEDICAL CENTER	LOS ANGELES	N/A	436	1.85%
PRESBYTERIAN INTERCOMMUNITY HOSPITAL	LOS ANGELES	N/A	327	1.39%
PROVIDENCE HOLY CROSS MEDICAL CENTER	LOS ANGELES	N/A	255	1.08%
PROVIDENCE SAINT JOSEPH MEDICAL CENTER	LOS ANGELES	N/A	426	1.81%
ROBERT F. KENNEDY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	201	0.85%
SAN DIMAS COMMUNITY HOSPITAL	LOS ANGELES	TENET HEALTHCARE CORP	93	0.40%
SAN GABRIEL VALLEY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	274	1.16%
SAN PEDRO PENINSULA HOSPITAL	LOS ANGELES	N/A	509	2.16%

## L. Regional Available Beds Statistics, 2000

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH CARE SYSTEM	AVAILABLE BEDS	SHARE OF TOTAL AVAILABLE BEDS
SAN VICENTE HOSPITAL	LOS ANGELES	N/A	17	0.07%
SANTA MARTA HOSPITAL	LOS ANGELES	N/A	94	0.40%
SANTA TERESITA HOSPITAL	LOS ANGELES	N/A	213	0.91%
SHERMAN OAKS HOSPITAL & HEALTH CENTER	LOS ANGELES	N/A	153	0.65%
SHRINERS HOSPITAL - LOS ANGELES	LOS ANGELES	N/A	60	0.25%
SPECIALTY HOSPITAL OF SOUTHERN CAL	LOS ANGELES	N/A	234	0.99%
ST. FRANCIS MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	353	1.50%
ST. MARY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	425	1.81%
ST. VINCENT MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	250	1.06%
STAR VIEW ADOLESCENT - PHF	LOS ANGELES	N/A	16	0.07%
TARZANA TREATMENT CENTER	LOS ANGELES	N/A	60	0.25%
TEMPLE COMMUNITY HOSPITAL	LOS ANGELES	N/A	170	0.72%
TOM REDGATE MEMORIAL RECOVERY CENTER	LOS ANGELES	N/A	63	0.27%
TORRANCE MEMORIAL MEDICAL CENTER	LOS ANGELES	N/A	365	1.55%
TRI-CITY REGIONAL MEDICAL CENTER	LOS ANGELES	N/A	127	0.54%
UCLA (**Includes UCLA's 3 hospital locations)	LOS ANGELES	UNIVERSITY OF CALIFORNIA	981	4.17%
USC KENNETH NORRIS JR. CANCER HOSPITAL	LOS ANGELES	N/A	46	0.20%
VALLEY PRESBYTERIAN HOSPITAL	LOS ANGELES	N/A	354	1.50%
VENCOR HOSPITAL - LOS ANGELES	LOS ANGELES	VENCOR INC	81	0.34%
VERDUGO HILLS HOSPITAL	LOS ANGELES	N/A	158	0.67%
WEST HILLS HOSPITAL & MEDICAL CENTER	LOS ANGELES	COLUMBIA/HCA HEALTHCARE CORP	236	1.00%
WHITE MEMORIAL MEDICAL CENTER	LOS ANGELES	ADVENTIST HEALTH	375	1.59%
		<b>TOTAL</b>	<b>23,533</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>172</b>	<b>0.73%</b>

**Figure L-4.**  
**Orange County Health Services Area Available Beds**  
*(Excludes the state hospital in this Health Services Area: Fairview Developmental Center)*

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH CARE SYSTEM	AVAILABLE BEDS	SHARE OF TOTAL AVAILABLE BEDS
ANAHEIM GENERAL HOSPITAL	ORANGE	PACIFIC HEALTH CORPORATION	143	2.70%
ANAHEIM MEMORIAL MEDICAL CENTER	ORANGE	MEMORIAL HEALTH SERVICES	374	7.07%
BREA COMMUNITY HOSPITAL	ORANGE	N/A	149	2.82%
CHAPMAN MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	114	2.16%
CHILDREN'S HOSPITAL AT MISSION	ORANGE	N/A	48	0.91%
CHILDREN'S HOSPITAL OF ORANGE COUNTY	ORANGE	N/A	192	3.63%
COLLEGE HOSPITAL COSTA MESA	ORANGE	N/A	119	2.25%
FOUNTAIN VALLEY RGNL HOSP & MC-EUCLID	ORANGE	TENET HEALTHCARE CORP	405	7.66%
GARDEN GROVE HOSP & MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	167	3.16%
HEALTHBRIDGE CHILDRENS REHAB HOSPITAL	ORANGE	N/A	24	0.45%
HOAG MEMORIAL HOSPITAL PRESBYTERIAN	ORANGE	N/A	345	6.52%
HUNTINGTON BEACH HOSPITAL	ORANGE	N/A	134	2.53%
IRVINE MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	176	3.33%
KAISER FDN HOSP - ANAHEIM	ORANGE	KAISER FOUNDATION	150	2.84%
LA PALMA INTERCOMMUNITY HOSPITAL	ORANGE	N/A	141	2.67%
MISSION HOSPITAL REGIONAL MEDICAL CENTER	ORANGE	ST. JOSEPH HEALTH SYSTEM	254	4.80%
ORANGE COAST MEMORIAL MEDICAL CENTER	ORANGE	MEMORIAL HEALTH SERVICES	230	4.35%
ORANGE COUNTY COMM HOSP - BUENA PARK	ORANGE	N/A	138	2.61%
SADDLEBACK MEMORIAL MEDICAL CENTER	ORANGE	MEMORIAL HEALTH SERVICES	218	4.12%
SAN CLEMENTE HOSPITAL & MED CTR	ORANGE	N/A	71	1.34%
SOUTH COAST MEDICAL CENTER	ORANGE	ADVENTIST HEALTH	195	3.69%
ST. JOSEPH HOSPITAL - ORANGE	ORANGE	N/A	365	6.90%
ST. JUDE MEDICAL CENTER	ORANGE	ST. JOSEPH HEALTH SYSTEM	330	6.24%
TUSTIN HOSPITAL MEDICAL CENTER	ORANGE	PACIFIC HEALTH CORPORATION	64	1.21%
UC IRVINE	ORANGE	UNIVERSITY OF CALIFORNIA	383	7.24%
VENCOR HOSPITAL - BREA	ORANGE	VENCOR INC	48	0.91%
VENCOR HOSPITAL - ORANGE COUNTY	ORANGE	VENCOR INC	99	1.87%
WEST ANAHEIM MEDICAL CENTER	ORANGE	N/A	213	4.03%
		<b>TOTAL</b>	<b>5,289</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>159</b>	<b>3.00%</b>



**Figure L-5.  
San Diego/Imperial Health Services Area Available Beds**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH CARE SYSTEM	AVAILABLE BEDS	SHARE OF TOTAL AVAILABLE BEDS
ALVARADO PARKWAY INSTITUTE BHS	SAN DIEGO	N/A	62	0.90%
AURORA SAN DIEGO	SAN DIEGO	N/A	80	1.16%
BAYVIEW HOSPITAL & MENTAL HEALTH SYSTEM	SAN DIEGO	N/A	64	0.93%
CHARTER ALVARADO BEHAVIORAL HLTH SYSTEM	SAN DIEGO	N/A	50	0.73%
CHARTER HOSPITAL OF SAN DIEGO	SAN DIEGO	N/A	80	1.16%
CHILDREN'S HOSPITAL - SAN DIEGO	SAN DIEGO	N/A	270	3.93%
CONTINENTAL REHAB HOSP FOR SAN DIEGO	SAN DIEGO	SUN HEALTHCARE GROUP INC.	110	1.60%
EL CENTRO REGIONAL MEDICAL CENTER	IMPERIAL	N/A	107	1.56%
FALLBROOK HOSPITAL DISTRICT	SAN DIEGO	N/A	146	2.13%
GROSSMONT HOSPITAL	SAN DIEGO	SAN DIEGO HOSPITAL ASSOCIATION	412	6.00%
KAISER FDN HOSP - SAN DIEGO	SAN DIEGO	KAISER FOUNDATION	337	4.91%
MISSION BAY HOSPITAL	SAN DIEGO	N/A	128	1.86%
PALOMAR MEDICAL CENTER	SAN DIEGO	N/A	424	6.17%
PARADISE VALLEY HOSPITAL	SAN DIEGO	ADVENTIST HEALTH	237	3.45%
PIONEERS MEMORIAL HOSPITAL	IMPERIAL	N/A	99	1.44%
POMERADO HOSPITAL	SAN DIEGO	N/A	238	3.46%
SAN DIEGO COUNTY PSYCHIATRIC HOSPITAL	SAN DIEGO	N/A	431	6.27%
SAN DIEGO HOSPICE ACUTE CARE CENTER	SAN DIEGO	N/A	24	0.35%
SCRIPPS GREEN HOSPITAL	SAN DIEGO	CATHOLIC HEALTHCARE WEST	168	2.45%
SCRIPPS MEMORIAL HOSPITAL - CHULA VISTA	SAN DIEGO	CATHOLIC HEALTHCARE WEST	152	2.21%
SCRIPPS MEMORIAL HOSPITAL - ENCINITAS	SAN DIEGO	CATHOLIC HEALTHCARE WEST	133	1.94%
SCRIPPS MEMORIAL HOSPITAL - LA JOLLA	SAN DIEGO	CATHOLIC HEALTHCARE WEST	356	5.18%
SCRIPPS MERCY HOSPITAL	SAN DIEGO	CATHOLIC HEALTHCARE WEST	447	6.51%
SHARP CABRILLO HOSPITAL	SAN DIEGO	SAN DIEGO HOSPITAL ASSOCIATION	86	1.25%
SHARP CHULA VISTA MEDICAL CENTER	SAN DIEGO	SAN DIEGO HOSPITAL ASSOCIATION	306	4.45%
SHARP CORONADO HOSPITAL & HEALTHCARE CTR	SAN DIEGO	SAN DIEGO HOSPITAL ASSOCIATION	204	2.97%
SHARP MARY BIRCH HOSPITAL FOR WOMEN	SAN DIEGO	SAN DIEGO HOSPITAL ASSOCIATION	166	2.42%
SHARP MEMORIAL HOSPITAL	SAN DIEGO	SAN DIEGO HOSPITAL ASSOCIATION	475	6.92%
SHARP VISTA PACIFICA	SAN DIEGO	SAN DIEGO HOSPITAL ASSOCIATION	12	0.17%
TRI-CITY MEDICAL CENTER	SAN DIEGO	N/A	397	5.78%
UC SAN DIEGO (**Includes UCSD's 2 hospital locations)	SAN DIEGO	UNIVERSITY OF CALIFORNIA	498	7.25%
VENCOR HOSPITAL - SAN DIEGO	SAN DIEGO	VENCOR INC	70	1.02%
VILLA VIEW COMMUNITY HOSPITAL	SAN DIEGO	N/A	100	1.46%
		<b>TOTAL</b>	<b>6,869</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>152</b>	<b>2.21%</b>



## M. Regional Hospital Discharges, 2000

Source: OSHPD Annual Hospital Utilization Report, 2000. Data excludes state hospitals.

### General Acute Care Utilization Statistics

**Figure M-1.**  
**Golden Empire Health Services Area GAC Hospital Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	GAC DISCHARGES	SHARE OF TOTAL GAC DISCHARGES
BARTON MEMORIAL HOSPITAL	EL DORADO	GEN ACUTE CARE	N/A	4,046	2.16%
FREMONT MEDICAL CENTER	SUTTER	GEN ACUTE CARE	N/A	6,921	3.70%
KAISER FOUNDATION HOSPITAL - SACRAMENTO	SACRAMENTO	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	17,954	9.59%
KAISER FOUNDATION HOSPITAL - SOUTH SACRAMENTO	SACRAMENTO	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	11,272	6.02%
KAISER FOUNDATION HOSPITAL - VALLEY MED CENTER	PLACER	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	8,450	4.52%
MARSHALL HOSPITAL	EL DORADO	RURAL GAC	N/A	5,002	2.67%
MERCY GENERAL HOSPITAL	SACRAMENTO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	15,704	8.39%
MERCY HOSPITAL - FOLSOM	SACRAMENTO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	3,929	2.10%
MERCY SAN JUAN HOSPITAL	SACRAMENTO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	15,290	8.17%
METHODIST HOSPITAL OF SACRAMENTO	SACRAMENTO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	6,354	3.40%
RIDEOUT MEMORIAL HOSPITAL	YUBA	GEN ACUTE CARE	N/A	6,614	3.53%
SHRINERS HOSPITALS FOR CHILDREN NORTHERN CALIF.	SACRAMENTO	GEN ACUTE CARE	N/A	1,199	0.64%
SIERRA NEVADA MEMORIAL HOSPITAL	NEVADA	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	6,306	3.37%
SIERRA VALLEY DISTRICT HOSPITAL	SIERRA	RURAL GAC	N/A	26	0.01%
SUTTER AUBURN FAITH HOSPITAL	PLACER	GEN ACUTE CARE	SUTTER HEALTH	4,911	2.62%
SUTTER DAVIS HOSPITAL	YOLO	GEN ACUTE CARE	SUTTER HEALTH	2,835	1.51%
SUTTER GENERAL HOSPITAL	SACRAMENTO	GEN ACUTE CARE	SUTTER HEALTH	10,633	5.68%
SUTTER MEMORIAL HOSPITAL	SACRAMENTO	GEN ACUTE CARE	SUTTER HEALTH	15,375	8.22%
SUTTER ROSEVILLE MEDICAL CENTER	PLACER	GEN ACUTE CARE	SUTTER HEALTH	11,264	6.02%
TAHOE FOREST HOSPITAL	NEVADA	RURAL GAC	N/A	2,167	1.16%
UC DAVIS	SACRAMENTO	GEN ACUTE CARE	UNIVERSITY OF CALIFORNIA	26,114	13.95%
VENCOR HOSPITAL - SACRAMENTO	SACRAMENTO	GEN ACUTE CARE	N/A	235	0.13%
WOODLAND MEMORIAL HOSPITAL	YOLO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	4,547	2.43%
			<b>TOTAL</b>	<b>187,148</b>	<b>100.00%</b>
			<b>MEDIAN</b>	<b>6,354</b>	<b>3.40%</b>

**Figure M-2.  
West Bay Health Services Area GAC Hospital Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	GAC DISCHARGES	SHARE OF TOTAL GAC DISCHARGES
CALIFORNIA PACIFIC MEDICAL CENTER - DAVIES CAMPUS	SAN FRANCISCO	GEN ACUTE CARE	SUTTER HEALTH	2876	1.82%
CALIFORNIA PACIFIC MEDICAL CENTER - PACIFIC CAMPUS	SAN FRANCISCO	GEN ACUTE CARE	SUTTER HEALTH	15230	9.62%
CALIFORNIA PACIFIC MEDICAL CENTER - WEST CAMPUS	SAN FRANCISCO	GEN ACUTE CARE	SUTTER HEALTH	7463	4.72%
CHINESE HOSPITAL	SAN FRANCISCO	GEN ACUTE CARE	N/A	1832	1.16%
KAISER FOUNDATION HOSPITAL - GEARY S F	SAN FRANCISCO	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	9605	6.07%
KAISER FOUNDATION HOSPITAL - REDWOOD CITY	SAN MATEO	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	7402	4.68%
KAISER FOUNDATION HOSPITAL - SAN RAFAEL	MARIN	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	4670	2.95%
KAISER FOUNDATION HOSPITAL - SO SAN FRANCISCO	SAN MATEO	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	6443	4.07%
KENTFIELD REHABILITATION HOSPITAL	MARIN	GEN ACUTE CARE	N/A	440	0.28%
LAGUNA HONDA HOSPITAL & REHABILITATION CENTER	SAN FRANCISCO	GEN ACUTE CARE	N/A	168	0.11%
MARIN GENERAL HOSPITAL	MARIN	GEN ACUTE CARE	SUTTER HEALTH	10119	6.39%
MENLO PARK SURGICAL HOSPITAL	SAN MATEO	GEN ACUTE CARE	N/A	536	0.34%
MILLS PENINSULA HEALTH CENTER	SAN MATEO	GEN ACUTE CARE	SUTTER HEALTH	518	0.33%
MILLS-PENINSULA MEDICAL CENTER	SAN MATEO	GEN ACUTE CARE	SUTTER HEALTH	12310	7.78%
NOVATO COMMUNITY HOSPITAL	MARIN	GEN ACUTE CARE	SUTTER HEALTH	1919	1.21%
SAN FRANCISCO GENERAL HOSPITAL	SAN FRANCISCO	GEN ACUTE CARE	N/A	14114	8.92%
SAN MATEO CO. GENERAL HOSPITAL	SAN MATEO	GEN ACUTE CARE	N/A	2581	1.63%
SEQUOIA HOSPITAL	SAN MATEO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	7668	4.84%
SETON MEDICAL CENTER	SAN MATEO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	9361	5.91%
ST. FRANCIS MEMORIAL HOSPITAL - SAN FRANCISCO	SAN FRANCISCO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	5072	3.20%
ST. LUKE'S HOSPITAL	SAN FRANCISCO	GEN ACUTE CARE	N/A	5139	3.25%
ST. MARY'S MEDICAL CENTER - SAN FRANCISCO	SAN FRANCISCO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	7623	4.82%
UC SAN FRANCISCO (**does not include Langley Porter Hospital)	SAN FRANCISCO	GEN ACUTE CARE	UC San Francisco STANFORD HEALTH CARE	25191	15.92%
<b>TOTAL</b>				<b>158,280</b>	<b>100.00%</b>
<b>MEDIAN</b>				<b>6,443</b>	<b>4.07%</b>

**Figure M-3.**  
**Los Angeles County Health Services Area GAC Hospital Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	GAC DISCHARGES	SHARE OF TOTAL GAC DISCHARGES
ALHAMBRA HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	3,638	0.39%
ANTELOPE VALLEY HOSPITAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	17,335	1.86%
AVALON MUNICIPAL HOSPITAL	LOS ANGELES	RURAL GAC	N/A	32	0.00%
BARLOW RESPIRATORY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	513	0.06%
BELLFLOWER MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	PACIFIC HEALTH CORP	3,382	0.36%
BELLWOOD GENERAL HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	2,936	0.32%
BEVERLY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	10,602	1.14%
BROTMAN MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	5,102	0.55%
CALIFORNIA HOSPITAL MEDICAL CENTER - LOS ANGELES	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	12,006	1.29%
CASA COLINA HOSPITAL FOR REHAB MEDICINE	LOS ANGELES	GEN ACUTE CARE	N/A	420	0.05%
CEDARS SINAI MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	41,733	4.48%
CENTINELA HOSPITAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	12,476	1.34%
CENTURY CITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	4,322	0.46%
CHILDREN'S HOSPITAL OF LOS ANGELES	LOS ANGELES	GEN ACUTE CARE	N/A	11,186	1.20%
CITRUS VALLEY MEDICAL CENTER - IC CAMPUS	LOS ANGELES	GEN ACUTE CARE	N/A	6,768	0.73%
CITRUS VALLEY MEDICAL CENTER - QV CAMPUS	LOS ANGELES	GEN ACUTE CARE	N/A	16,223	1.74%
CITY OF ANGELS MEDICAL CENTER - DOWNTOWN CAMPUS	LOS ANGELES	GEN ACUTE CARE	N/A	1,232	0.13%
CITY OF HOPE NATIONAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	4,299	0.46%
COAST PLAZA DOCTORS HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	4,778	0.51%
COMMUNITY & MISSION HSP OF HNTG PARK - FLORENCE	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	3,857	0.41%
COMMUNITY & MISSION HSP OF HNTG PARK - SLAUSON	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	4,800	0.52%
COMMUNITY HOSPITAL OF GARDENA	LOS ANGELES	GEN ACUTE CARE	N/A	599	0.06%
DANIEL FREEMAN MARINA HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	3,111	0.33%
DANIEL FREEMAN MEMORIAL HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	11,816	1.27%
DOCTORS HOSPITAL OF WEST COVINA	LOS ANGELES	GEN ACUTE CARE	N/A	426	0.05%
DOWNEY REGIONAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	11,112	1.19%
EARL & LORRAINE MILLER CHILDRENS HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	3,280	0.35%
EAST LOS ANGELES DOCTORS HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	2,247	0.24%
ENCINO-TARZANA REGIONAL MED CTR-ENCINO	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	2,995	0.32%
ENCINO-TARZANA REGIONAL MED CTR-TARZANA	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	12,787	1.37%
FOOTHILL PRESBYTERIAN HOSPITAL - JOHNSTON MEMORIAL	LOS ANGELES	GEN ACUTE CARE	N/A	5,331	0.57%
GARFIELD MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	11,551	1.24%
GLENDALE ADVENTIST MEDICAL CENTER - WILSON TERRACE	LOS ANGELES	GEN ACUTE CARE	ADVENTIST HEALTH	12,543	1.35%
GLENDALE MEMORIAL HOSPITAL & HEALTH CENTER	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	12,998	1.40%
GOOD SAMARITAN HOSPITAL - LOS ANGELES	LOS ANGELES	GEN ACUTE CARE	N/A	15,770	1.69%
GRANADA HILLS COMMUNITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	4,561	0.49%
GREATER EL MONTE COMMUNITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	4,160	0.45%
HENRY MAYO NEWHALL MEMORIAL HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	8,103	0.87%

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	GAC DISCHARGES	SHARE OF TOTAL GAC DISCHARGES
HOLLYWOOD COMMUNITY HOSPITAL OF HOLLYWOOD	LOS ANGELES	GEN ACUTE CARE	N/A	2,215	0.24%
HUNTINGTON EAST VALLEY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	2,955	0.32%
HUNTINGTON MEMORIAL HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	22,397	2.40%
KAISER FOUNDATION HOSPITAL - BALDWIN PARK	LOS ANGELES	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	11,102	1.19%
KAISER FOUNDATION HOSPITAL - BELLFLOWER	LOS ANGELES	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	18,357	1.97%
KAISER FOUNDATION HOSPITAL - HARBOR CITY	LOS ANGELES	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	10,773	1.16%
KAISER FOUNDATION HOSPITAL - PANORAMA CITY	LOS ANGELES	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	12,344	1.33%
KAISER FOUNDATION HOSPITAL - SUNSET	LOS ANGELES	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	20,066	2.15%
KAISER FOUNDATION HOSPITAL - WEST LA	LOS ANGELES	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	11,364	1.22%
KAISER FOUNDATION HOSPITAL - WOODLAND HILLS	LOS ANGELES	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	10,828	1.16%
LAKEWOOD REGIONAL MEDICAL CENTER - SOUTH STREET	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	8,971	0.96%
LANCASTER COMMUNITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	5,880	0.63%
LINCOLN HOSPITAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	925	0.10%
LITTLE COMPANY OF MARY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	14,479	1.55%
LONG BEACH MEMORIAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	MEMORIAL HEALTH SERVICES	30,011	3.22%
LOS ANGELES CO HARBOR - UCLA MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	COUNTY OF LOS ANGELES	21,570	2.32%
LOS ANGELES CO HIGH DESERT HOSPITAL	LOS ANGELES	GEN ACUTE CARE	COUNTY OF LOS ANGELES	1,347	0.14%
LOS ANGELES CO MARTIN LUTHER KING JR/DREW MED CTR	LOS ANGELES	GEN ACUTE CARE	COUNTY OF LOS ANGELES	13,738	1.47%
LOS ANGELES CO OLIVE VIEW MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	COUNTY OF LOS ANGELES	13,383	1.44%
LOS ANGELES CO RANCHO LOS AMIGOS NATIONAL REHAB CENTER	LOS ANGELES	GEN ACUTE CARE	COUNTY OF LOS ANGELES	3,528	0.38%
LOS ANGELES CO USC MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	COUNTY OF LOS ANGELES	43,745	4.70%
LOS ANGELES COMMUNITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	4,616	0.50%
LOS ANGELES METROPOLITAN MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	PACIFIC HEALTH CORP	4,315	0.46%
MEMORIAL HOSPITAL OF GARDENA	LOS ANGELES	GEN ACUTE CARE	N/A	3,996	0.43%
METHODIST HOSPITAL OF SOUTHERN CALIFORNIA	LOS ANGELES	GEN ACUTE CARE	N/A	12,007	1.29%
MIDWAY HOSPITAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	4,216	0.45%
MISSION COMMUNITY HOSPITAL - PANORAMA CAMPUS	LOS ANGELES	GEN ACUTE CARE	N/A	1,771	0.19%
MONROVIA COMMUNITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	1,718	0.18%
MONTEREY PARK HOSPITAL	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	5,298	0.57%
MOTION PICTURE & TELEVISION HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	790	0.08%
NORTHRIDGE HOSPITAL MEDICAL CENTER - ROSCOE	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	16,455	1.77%
NORTHRIDGE HOSPITAL MEDICAL CENTER - SHERMAN WAY	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	7,839	0.84%
NORWALK COMMUNITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	1,790	0.19%
ORTHOPAEDIC HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	1,781	0.19%
PACIFIC ALLIANCE MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	4,919	0.53%
PACIFIC HOSPITAL OF LONG BEACH	LOS ANGELES	GEN ACUTE CARE	N/A	3,988	0.43%
PACIFICA HOSPITAL OF THE VALLEY	LOS ANGELES	GEN ACUTE CARE	N/A	3,638	0.39%
POMONA VALLEY HOSPITAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	18,891	2.03%
PRESBYTERIAN INTERCOMMUNITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	14,805	1.59%
PROVIDENCE HOLY CROSS MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	10,618	1.14%
PROVIDENCE SAINT JOSEPH MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	16,370	1.76%
QUEEN OF ANGELS/HOLLYWOOD PRESBYTERIAN MED CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	16,266	1.75%

## M. Regional Hospital Discharges, 2000

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	GAC DISCHARGES	SHARE OF TOTAL GAC DISCHARGES
ROBERT F. KENNEDY MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	4,005	0.43%
SAN DIMAS COMMUNITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	3,393	0.36%
SAN GABRIEL VALLEY MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	8,964	0.96%
SAN PEDRO PENINSULA HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	5,819	0.62%
SAN VICENTE HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	197	0.02%
SANTA MARTA HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	3,412	0.37%
SANTA TERESITA HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	1,759	0.19%
SHERMAN OAKS HOSPITAL AND HEALTH CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	3,362	0.36%
SHRINERS HOSPITAL FOR CRIPPLED CHILDREN - L.A.	LOS ANGELES	GEN ACUTE CARE	N/A	1,808	0.19%
SPECIALTY HOSPITAL OF SOUTHERN CAL	LOS ANGELES	GEN ACUTE CARE	N/A	773	0.08%
SPECIALTY HOSPITAL OF SOUTHERN CAL - SAN GABRIEL VALLEY	LOS ANGELES	GEN ACUTE CARE	N/A	579	0.06%
ST. FRANCIS MEDICAL CENTER - LYNWOOD	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	16,610	1.78%
ST. JOHN'S HOSPITAL & HEALTH CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	9,849	1.06%
ST. LUKE MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	5,411	0.58%
ST. MARY MEDICAL CENTER - LONG BEACH	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	11,404	1.22%
ST. VINCENT MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	9,058	0.97%
SUBURBAN MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	6,111	0.66%
TEMPLE COMMUNITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	2,808	0.30%
TORRANCE MEMORIAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	21,182	2.27%
TRI-CITY REGIONAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	2,175	0.23%
UCLA (**Does not include UCLA Neuropsychiatric Institute)	LOS ANGELES	GEN ACUTE CARE	UNIVERSTIY OF CALIFORNIA	28,063	3.01%
USC KENNETH NORRIS, JR. CANCER HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	2,544	0.27%
USC UNIVERSITY HOSPITAL	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	8,303	0.89%
VALLEY PRESBYTERIAN HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	11,987	1.29%
VENCOR HOSPITAL - LOS ANGELES	LOS ANGELES	GEN ACUTE CARE	N/A	427	0.05%
VERDUGO HILLS HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	4,502	0.48%
WEST HILLS HOSPITAL & MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	COLUMBIA / HCA HEALTHCARE CORP	7,773	0.83%
WHITE MEMORIAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	ADVENTIST HEALTH	11,620	1.25%
WHITTIER HOSPITAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	10,410	1.12%
			<b>TOTAL</b>	<b>931,403</b>	<b>100.00%</b>
			<b>MEDIAN</b>	<b>5,411</b>	<b>0.58%</b>

**Figure M-4.  
Orange Health Services Area GAC Hospital Discharges**

HOSPITAL/MEDICAL CENTER	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	GAC DISCHARGES	SHARE OF TOTAL GAC DISCHARGES
ANAHEIM GENERAL HOSPITAL	ORANGE	GEN ACUTE CARE	PACIFIC HEALTH CORP	3,199	1.33%
ANAHEIM MEMORIAL MEDICAL CENTER	ORANGE	GEN ACUTE CARE	MEMORIAL HEALTH SERVICES	13,958	5.80%
BREA COMMUNITY HOSPITAL	ORANGE	GEN ACUTE CARE	N/A	2,311	0.96%
CHAPMAN MEDICAL CENTER	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	2,029	0.84%
CHILDREN'S HOSPITAL AT MISSION	ORANGE	GEN ACUTE CARE	N/A	1,892	0.79%
CHILDREN'S HOSPITAL OF ORANGE COUNTY	ORANGE	GEN ACUTE CARE	N/A	7,736	3.22%
COASTAL COMMUNITIES HOSPITAL	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	3,790	1.58%
FOUNTAIN VALLEY RGNL HOSP & MED CTR - EUCLID	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	16,642	6.92%
GARDEN GROVE HOSPITAL & MEDICAL CENTER	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	7,685	3.20%
HOAG MEMORIAL HOSPITAL PRESBYTERIAN	ORANGE	GEN ACUTE CARE	N/A	23,421	9.74%
HUNTINGTON BEACH HOSPITAL	ORANGE	GEN ACUTE CARE	COLUMBIA / HCA HEALTHCARE CORP	3,162	1.31%
IRVINE MEDICAL CENTER	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	6,994	2.91%
KAISER FOUNDATION HOSPITAL - ANAHEIM	ORANGE	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	10,358	4.31%
LA PALMA INTERCOMMUNITY HOSPITAL	ORANGE	GEN ACUTE CARE	N/A	2,310	0.96%
LOS ALAMITOS MEDICAL CENTER	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	8,298	3.45%
MISSION HOSPITAL REGIONAL MEDICAL CENTER	ORANGE	GEN ACUTE CARE	ST JOSEPH HEALTH SYSTEM	14,600	6.07%
ORANGE COAST MEMORIAL MEDICAL CENTER	ORANGE	GEN ACUTE CARE	MEMORIAL HEALTH SERVICES	7,113	2.96%
PLACENTIA LINDA HOSPITAL	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	3,545	1.47%
SADDLEBACK MEMORIAL MEDICAL CENTER	ORANGE	GEN ACUTE CARE	MEMORIAL HEALTH SERVICES	12,903	5.36%
SAN CLEMENTE HOSPITAL & MEDICAL CENTER	ORANGE	GEN ACUTE CARE	N/A	2,204	0.92%
SANTA ANA HOSPITAL MEDICAL CENTER	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	3,295	1.37%
SOUTH COAST MEDICAL CENTER	ORANGE	GEN ACUTE CARE	ADVENTIST HEALTH	3,118	1.30%
SPECIALTY HOSPITAL OF SOUTHERN CAL - SANTA ANA	ORANGE	GEN ACUTE CARE	N/A	476	0.20%
ST. JOSEPH HOSPITAL - ORANGE	ORANGE	GEN ACUTE CARE	N/A	23,578	9.80%
ST. JUDE MEDICAL CENTER	ORANGE	GEN ACUTE CARE	ST JOSEPH HEALTH SYSTEM	15,442	6.42%
TUSTIN HOSPITAL MEDICAL CENTER	ORANGE	GEN ACUTE CARE	PACIFIC HEALTH CORP	639	0.27%
TUSTIN REHABILITATION HOSPITAL	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	913	0.38%
UC IRVINE	ORANGE	GEN ACUTE CARE	UNIVERSTIY OF CALIFORNIA	14,555	6.05%
VENCOR HOSPITAL - BREA	ORANGE	GEN ACUTE CARE	N/A	368	0.15%
VENCOR HOSPITAL - ORANGE COUNTY	ORANGE	GEN ACUTE CARE	N/A	617	0.26%
WEST ANAHEIM MEDICAL CENTER	ORANGE	GEN ACUTE CARE	COLUMBIA / HCA HEALTHCARE CORP	6,825	2.84%
WESTERN MEDICAL CENTER - SANTA ANA	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	11,520	4.79%
WESTERN MEDICAL CENTER HOSPITAL - ANAHEIM	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	5,022	2.09%
<b>TOTAL</b>				<b>240,518</b>	<b>100.00%</b>
<b>MEDIAN</b>				<b>5,022</b>	<b>2.09%</b>



**Figure M-5.**  
**San Diego/Imperial Health Services Area GAC Hospital Discharges**

HOSPITAL/MEDICAL CENTER	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	GAC DISCHARGES	SHARE OF TOTAL GAC DISCHARGES
ALVARADO HOSPITAL MEDICAL CENTER	SAN DIEGO	GEN ACUTE CARE	TENET HEALTHCARE CORP	10,913	4.41%
CHILDREN'S HOSPITAL - SAN DIEGO	SAN DIEGO	GEN ACUTE CARE	N/A	12,009	4.85%
CONTINENTAL REHABILITATION HOSPITAL OF SAN DIEGO	SAN DIEGO	GEN ACUTE CARE	N/A	328	0.13%
EL CENTRO REGIONAL MEDICAL CENTER	IMPERIAL	GEN ACUTE CARE	N/A	6,574	2.66%
FALLBROOK HOSPITAL DISTRICT	SAN DIEGO	GEN ACUTE CARE	N/A	2,082	0.84%
GROSSMONT HOSPITAL	SAN DIEGO	GEN ACUTE CARE	SAN DIEGO HOSPITAL ASSOC	16,905	6.83%
KAISER FOUNDATION HOSPITAL - SAN DIEGO	SAN DIEGO	GEN ACUTE CARE	KAISER FOUNDATION HOSPITALS	26,245	10.60%
PALOMAR MEDICAL CENTER	SAN DIEGO	GEN ACUTE CARE	N/A	17,291	6.99%
PARADISE VALLEY HOSPITAL	SAN DIEGO	GEN ACUTE CARE	ADVENTIST HEALTH	8,259	3.34%
PIONEERS MEMORIAL HOSPITAL	IMPERIAL	GEN ACUTE CARE	N/A	5,046	2.04%
POMERADO HOSPITAL	SAN DIEGO	GEN ACUTE CARE	N/A	5,637	2.28%
SAN DIEGO HOSPICE ACUTE CARE CENTER	SAN DIEGO	GEN ACUTE CARE	N/A	931	0.38%
SCRIPPS GREEN HOSPITAL	SAN DIEGO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	9,455	3.82%
SCRIPPS MEMORIAL HOSPITAL - CHULA VISTA	SAN DIEGO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	8,084	3.27%
SCRIPPS MEMORIAL HOSPITAL - ENCINITAS	SAN DIEGO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	6,724	2.72%
SCRIPPS MEMORIAL HOSPITAL - LA JOLLA	SAN DIEGO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	12,933	5.23%
SCRIPPS MERCY HOSPITAL	SAN DIEGO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	21,019	8.49%
SHARP CHULA VISTA MEDICAL CENTER	SAN DIEGO	GEN ACUTE CARE	SAN DIEGO HOSPITAL ASSOC	10,366	4.19%
SHARP CORONADO HOSPITAL AND HEALTHCARE CENTER	SAN DIEGO	GEN ACUTE CARE	SAN DIEGO HOSPITAL ASSOC	2,009	0.81%
SHARP MARY BIRCH HOSPITAL FOR WOMEN	SAN DIEGO	GEN ACUTE CARE	SAN DIEGO HOSPITAL ASSOC	9,402	3.80%
SHARP MEMORIAL HOSPITAL	SAN DIEGO	GEN ACUTE CARE	SAN DIEGO HOSPITAL ASSOC	16,405	6.63%
TRI-CITY MEDICAL CENTER	SAN DIEGO	GEN ACUTE CARE	N/A	16,009	6.47%
UC SAN DIEGO (**Includes UCSD's 2 hospital locations)	SAN DIEGO	GEN ACUTE CARE	UNIVERSTIY OF CALIFORNIA	21,100	8.52%
VENCOR HOSPITAL - SAN DIEGO	SAN DIEGO	GEN ACUTE CARE	N/A	566	0.23%
VILLA VIEW COMMUNITY HOSPITAL	SAN DIEGO	GEN ACUTE CARE	N/A	1,221	0.49%
			<b>TOTAL</b>	<b>247,513</b>	<b>100.00%</b>
			<b>MEDIAN</b>	<b>9,402</b>	<b>3.80%</b>

## Acute Psychiatric Discharges

UC Davis Medical Center did not have psychiatric discharges in 2000. Therefore, the Golden Empire Health Services Area is not included among the following figures.

**Figure M-6.  
West Bay Health Services Area Acute Psychiatric Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	ACUTE PSYCHIATRIC DISCHARGES	SHARE OF TOTAL ACUTE PSYCHIATRIC DISCHARGES
CALIFORNIA PACIFIC MEDICAL CENTER - DAVIES CAMPUS	SAN FRANCISCO	GEN ACUTE CARE	SUTTER HEALTH	222	2.16%
CALIFORNIA PACIFIC MEDICAL CENTER - PACIFIC CAMPUS	SAN FRANCISCO	GEN ACUTE CARE	SUTTER HEALTH	616	6.00%
HEBREW HOME FOR THE AGED DISABLED/APH	SAN FRANCISCO	PSYCHIATRIC	N/A	2	0.02%
UC SAN FRANCISCO (**LANGLEY PORTER PSYCHIATRIC INSTITUTE)	SAN FRANCISCO	PSYCHIATRIC	UNIVERSTIY OF CALIFORNIA	892	8.69%
MARIN GENERAL HOSPITAL	MARIN	GEN ACUTE CARE	SUTTER HEALTH	632	6.15%
MILLS-PENINSULA MEDICAL CENTER	SAN MATEO	GEN ACUTE CARE	SUTTER HEALTH	997	9.71%
SAN FRANCISCO GENERAL HOSPITAL	SAN FRANCISCO	GEN ACUTE CARE	N/A	2,643	25.74%
SAN MATEO CO. GENERAL HOSPITAL	SAN MATEO	GEN ACUTE CARE	N/A	808	7.87%
SEQUOIA HOSPITAL	SAN MATEO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	471	4.59%
ST. FRANCIS MEMORIAL HOSPITAL - SAN FRANCISCO	SAN FRANCISCO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	757	7.37%
ST. LUKE'S HOSPITAL	SAN FRANCISCO	GEN ACUTE CARE	N/A	1,087	10.58%
ST. MARY'S MEDICAL CENTER - SAN FRANCISCO	SAN FRANCISCO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	1,143	11.13%
			<b>TOTAL</b>	<b>10,270</b>	<b>100.00%</b>
			<b>MEDIAN</b>	<b>783</b>	<b>7.62%</b>

**Figure M-7.**  
**Los Angeles County Health Services Area Acute Psychiatric Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	ACUTE PSYCHIATRIC DISCHARGES	SHARE OF TOTAL ACUTE PSYCHIATRIC DISCHARGES
BROTMAN MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	1,581	10.70%
CENTINELA HOSPITAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	TENET HEALTHCARE CORP	247	1.67%
DANIEL FREEMAN MARINA HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	1,379	9.33%
DEL AMO HOSPITAL	LOS ANGELES	PSYCHIATRIC	N/A	2,158	14.61%
LA CASA PSYCHIATRIC HEALTH FACILITY	LOS ANGELES	PSYCH HEALTH FACILITY	N/A	240	1.62%
LOS ANGELES CO HARBOR - UCLA MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	COUNTY OF LOS ANGELES	966	6.54%
LOS ANGELES METROPOLITAN MED CTR-HAWTHORNE CAMPUS	LOS ANGELES	GEN ACUTE CARE	PACIFIC HEALTH CORP	1,745	11.81%
PACIFIC HOSPITAL OF LONG BEACH	LOS ANGELES	GEN ACUTE CARE	N/A	994	6.73%
ROBERT F. KENNEDY MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	1,385	9.37%
SAN PEDRO PENINSULA HOSPITAL	LOS ANGELES	GEN ACUTE CARE	N/A	508	3.44%
ST. MARY MEDICAL CENTER - LONG BEACH	LOS ANGELES	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	449	3.04%
STAR VIEW ADOLESCENT - P H F	LOS ANGELES	PSYCH HEALTH FACILITY	N/A	200	1.35%
TORRANCE MEMORIAL MEDICAL CENTER	LOS ANGELES	GEN ACUTE CARE	N/A	411	2.78%
UCLA (**UCLA NEUROPSYCHIATRIC HOSPITAL)	LOS ANGELES	PSYCHIATRIC	UNIVERSTIY OF CALIFORNIA	2,512	17.00%
			<b>TOTAL</b>	<b>14,775</b>	<b>100.00%</b>
			<b>MEDIAN</b>	<b>980</b>	<b>6.63%</b>

**Figure M-8.**  
**Orange County Health Services Area Acute Psychiatric Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	ACUTE PSYCHIATRIC DISCHARGES	SHARE OF TOTAL ACUTE PSYCHIATRIC DISCHARGES
ANAHEIM GENERAL HOSPITAL - BUENA PARK CAMPUS	ORANGE	GEN ACUTE CARE	PACIFIC HEALTH CORP	283	2.93%
CHAPMAN MEDICAL CENTER	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	48	0.50%
COASTAL COMMUNITIES HOSPITAL	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	375	3.88%
FOUNTAIN VALLEY RGNL HOSP & MED CTR - WARNER	ORANGE	PSYCHIATRIC	TENET HEALTHCARE CORP	379	3.92%
HUNTINGTON BEACH HOSPITAL	ORANGE	GEN ACUTE CARE	COLUMBIA / HCA HEALTHCARE CORP	695	7.19%
LA PALMA INTERCOMMUNITY HOSPITAL	ORANGE	GEN ACUTE CARE	N/A	416	4.30%
LOS ALAMITOS MEDICAL CENTER	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	377	3.90%
NEWPORT BAY HOSPITAL	ORANGE	PSYCHIATRIC	N/A	353	3.65%
SOUTH COAST MEDICAL CENTER	ORANGE	GEN ACUTE CARE	ADVENTIST HEALTH	769	7.95%
ST. JOSEPH HOSPITAL - ORANGE	ORANGE	GEN ACUTE CARE	N/A	1,145	11.84%
UC IRVINE	ORANGE	GEN ACUTE CARE	UNIVERSITY OF CALIFORNIA	1,425	14.73%
WEST ANAHEIM MEDICAL CENTER	ORANGE	GEN ACUTE CARE	COLUMBIA / HCA HEALTHCARE CORP	390	4.03%
WESTERN MEDICAL CENTER - SANTA ANA	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	437	4.52%
WESTERN MEDICAL CENTER HOSPITAL - ANAHEIM	ORANGE	GEN ACUTE CARE	TENET HEALTHCARE CORP	2,579	26.67%
			<b>TOTAL</b>	<b>9,671</b>	<b>100.00%</b>
			<b>MEDIAN</b>	<b>403</b>	<b>4.17%</b>

**Figure M-9.**  
**San Diego/Imperial Health Services Area Acute Psychiatric Discharges**

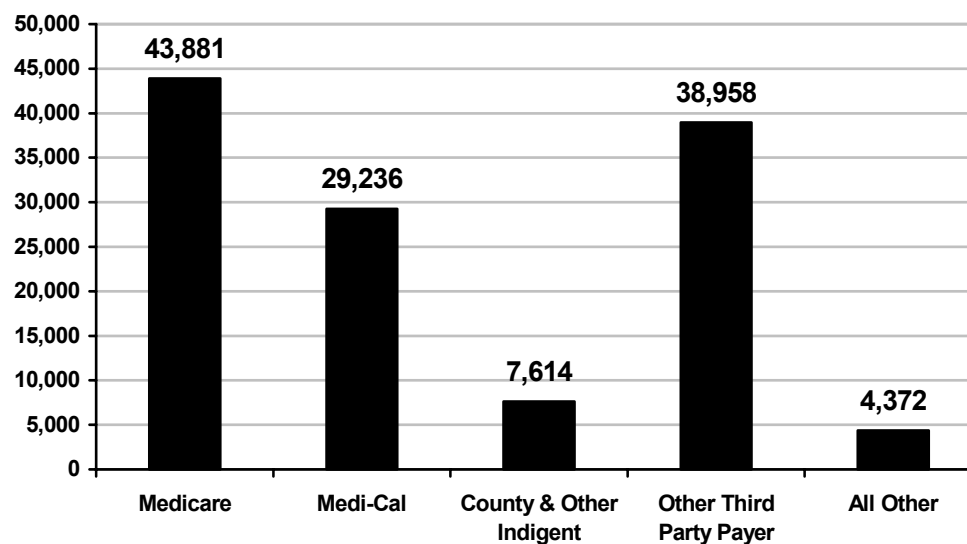
FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	TYPE OF FACILITY	HEALTH SYSTEM	ACUTE PSYCHIATRIC DISCHARGES	SHARE OF TOTAL ACUTE PSYCHIATRIC DISCHARGES
ALVARADO PARKWAY INSTITUTE B.H.S.	SAN DIEGO	PSYCHIATRIC	N/A	588	3.38%
AURORA SAN DIEGO	SAN DIEGO	PSYCHIATRIC	N/A	2,346	13.47%
GROSSMONT HOSPITAL	SAN DIEGO	GEN ACUTE CARE	SAN DIEGO HOSPITAL ASSOC	1,210	6.95%
PALOMAR MEDICAL CENTER	SAN DIEGO	GEN ACUTE CARE	N/A	892	5.12%
PARADISE VALLEY HOSPITAL	SAN DIEGO	GEN ACUTE CARE	ADVENTIST HEALTH	1,245	7.15%
POMERADO HOSPITAL	SAN DIEGO	GEN ACUTE CARE	N/A	239	1.37%
SAN DIEGO COUNTY PSYCHIATRIC HOSPITAL	SAN DIEGO	PSYCHIATRIC	N/A	997	5.72%
SCRIPPS MERCY HOSPITAL	SAN DIEGO	GEN ACUTE CARE	CATHOLIC HEALTHCARE WEST	1,236	7.10%
SHARP MEMORIAL HOSPITAL	SAN DIEGO	GEN ACUTE CARE	SAN DIEGO HOSPITAL ASSOC	5,007	28.75%
TRI-CITY MEDICAL CENTER	SAN DIEGO	GEN ACUTE CARE	N/A	803	4.61%
UC DAVIS (**Includes 2 hospital locations)	SAN DIEGO	GEN ACUTE CARE	UNIVERSTIY OF CALIFORNIA	1,407	8.08%
VILLA VIEW COMMUNITY HOSPITAL	SAN DIEGO	GEN ACUTE CARE	N/A	1,448	8.31%
			<b>TOTAL</b>	<b>17,418</b>	<b>100.00%</b>
			<b>MEDIAN</b>	<b>1,223</b>	<b>7.02%</b>



## N. Utilization Statistics for Aging and Poor Population, FY 2000

### UC Hospital Discharges by Payer

**Figure N-1.**  
**UC Hospital Discharges by Payer, FY 2000**  
*(payer categories include traditional and managed care patients)*



Source: OSHPD Hospital Annual Financial Data Profile, FY 2000

## California Health Systems (excluding Kaiser Foundation Hospital)

**Figure N-2.**  
**Medi-Cal and Indigent Hospital Discharges (Includes GAC and Non-GAC)**

HEALTH SYSTEM	TOTAL HOSPITAL DISCHARGES	% MEDI-CAL	% INDIGENT (COUNTY & OTHER INDIGENT)
ADVENTIST HEALTH	91,978	25.18%	1.39%
CATHOLIC HEALTHCARE WEST	421,798	20.73%	1.00%
COLUMBIA/HCA HEALTHCARE CORPORATION	35,665	15.23%	0.00%
COUNTY OF LOS ANGELES	102,859	45.78%	41.12%
MEMORIAL HEALTH SERVICES	57,550	7.63%	0.30%
SAN DIEGO HOSPITAL ASSOCIATION	63,425	17.68%	1.90%
ST. JOSEPH HEALTH SYSTEM	50,066	11.24%	1.37%
SUTTER HEALTH	227,933	15.74%	1.25%
TENET HEALTHCARE CORPORATION	45,226	18.15%	1.92%
UNIVERSITY OF CALIFORNIA	124,061	23.57%	6.14%
	<b>MEAN PROPORTION</b>	<b>20.09%</b>	<b>5.64%</b>



## Regional Inpatient Analysis (excluding State Facilities)

**Figure N-3.**  
**Golden Empire Health Services Area Medi-Cal and Indigent Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	MEDI-CAL DISCHARGES	SHARE OF TOTAL MEDI-CAL DISCHARGES	INDIGENT (COUNTY & OTHER INDIGENT) DISCHARGES	SHARE OF TOTAL INDIGENT DISCHARGES
BARTON MEMORIAL HOSPITAL	EL DORADO	N/A	505	1.51%	12	0.33%
EL DORADO COUNTY MENTAL HEALTH-PHF	EL DORADO	N/A	0	0.00%	0	0.00%
FREMONT HOSPITAL - YUBA CITY	SUTTER	N/A	1,324	3.97%	185	5.12%
HERITAGE OAKS HOSPITAL	SACRAMENTO	BEHAVIORAL HEALTHCARE CORP	226	0.68%	171	4.73%
KAISER FDN HOSP - SACRAMENTO	SACRAMENTO	KAISER	131	0.39%	14	0.39%
KAISER FDN HOSP - SOUTH SACRAMENTO	SACRAMENTO	KAISER	109	0.33%	4	0.11%
MARSHALL HOSPITAL	EL DORADO	N/A	511	1.53%	221	6.12%
MERCY GENERAL HOSPITAL	SACRAMENTO	CATHOLIC HEALTHCARE WEST	2,791	8.37%	135	3.74%
MERCY HOSPITAL - FOLSOM	SACRAMENTO	CATHOLIC HEALTHCARE WEST	204	0.61%	33	0.91%
MERCY SAN JUAN HOSPITAL	SACRAMENTO	CATHOLIC HEALTHCARE WEST	3,751	11.24%	278	7.70%
METHODIST HOSPITAL OF SACRAMENTO	SACRAMENTO	CATHOLIC HEALTHCARE WEST	2,269	6.80%	90	2.49%
RIDEOUT MEMORIAL HOSPITAL	YUBA	N/A	967	2.90%	387	10.71%
SACRAMENTO MENTAL HLTH TREATMENT CTR-PHF	SACRAMENTO	N/A	0	0.00%	0	0.00%
SHRINERS HOSPITAL - NORTHERN CALIF	SACRAMENTO	N/A	0	0.00%	0	0.00%
SIERRA NEVADA MEMORIAL HOSPITAL	NEVADA	CATHOLIC HEALTHCARE WEST	642	1.92%	166	4.60%
SIERRA VALLEY DISTRICT HOSPITAL	SIERRA	N/A	21	0.06%	0	0.00%
SIERRA VISTA HOSPITAL	SACRAMENTO	BEHAVIORAL HEALTHCARE CORP	209	0.63%	250	6.92%
SUTTER AUBURN FAITH HOSPITAL	PLACER	SUTTER HEALTH	427	1.28%	94	2.60%
SUTTER CENTER FOR PSYCHIATRY	SACRAMENTO	SUTTER HEALTH	2,308	6.92%	11	0.30%
SUTTER DAVIS HOSPITAL	YOLO	SUTTER HEALTH	617	1.85%	107	2.96%
SUTTER MEDICAL CENTER - SACRAMENTO	SACRAMENTO	SUTTER HEALTH	5,878	17.62%	613	16.97%
SUTTER ROSEVILLE MEDICAL CENTER	PLACER	SUTTER HEALTH	1,055	3.16%	31	0.86%
SUTTER-YUBA - PHF	SUTTER	N/A	320	0.96%	0	0.00%
TAHOE FOREST HOSPITAL	NEVADA	N/A	282	0.85%	6	0.17%
UC DAVIS	SACRAMENTO	UNIVERSITY OF CALIFORNIA	8,092	24.25%	754	20.87%
VENCOR HOSPITAL - SACRAMENTO	SACRAMENTO	VENCOR INC	2	0.01%	0	0.00%
WOODLAND MEMORIAL HOSPITAL	YOLO	CATHOLIC HEALTHCARE WEST	722	2.16%	50	1.38%
		<b>TOTAL</b>	<b>33,363</b>	<b>100.00%</b>	<b>3,612</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>505</b>	<b>1.51%</b>	<b>50</b>	<b>1.38%</b>

**Figure N-4.**  
**West Bay Health Services Area Medi-Cal and Indigent Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	MEDI-CAL DISCHARGES	SHARE OF TOTAL MEDI-CAL DISCHARGES	INDIGENT (COUNTY & OTHER INDIGENT) DISCHARGES	SHARE OF TOTAL INDIGENT DISCHARGES
CALIFORNIA PACIFIC MEDICAL CENTER	SAN FRANCISCO	SUTTER HEALTH	2,048	7.07%	28	1.24%
CHINESE HOSPITAL	SAN FRANCISCO	N/A	210	0.73%	0	0.00%
HEBREW HOME FOR THE AGED DISABLED	SAN FRANCISCO	N/A	131	0.45%	0	0.00%
KAISER FDN HOSP - GEARY (S.F.)	SAN FRANCISCO	N/A	67	0.23%	12	0.53%
KAISER FDN HOSP - REDWOOD CITY	SAN MATEO	N/A	22	0.08%	9	0.40%
KAISER FDN HOSP - SAN RAFAEL	MARIN	N/A	18	0.06%	5	0.22%
KAISER FDN HOSP - SOUTH SAN FRANCISCO	SAN MATEO	N/A	20	0.07%	0	0.00%
KENTFIELD REHABILITATION CENTER	MARIN	SUN HEALTHCARE GROUP INC.	18	0.06%	0	0.00%
LAGUNA HONDA HOSPITAL & REHAB CENTER	SAN FRANCISCO	N/A	932	3.22%	32	1.42%
MARIN GENERAL HOSPITAL	MARIN	SUTTER HEALTH	1,254	4.33%	336	14.91%
MENLO PARK SURGICAL HOSPITAL	SAN MATEO	N/A	0	0.00%	0	0.00%
MILLS-PENINSULA MEDICAL CENTER	SAN MATEO	SUTTER HEALTH	418	1.44%	0	0.00%
NOVATO COMMUNITY HOSPITAL	MARIN	SUTTER HEALTH	77	0.27%	29	1.29%
PACIFIC COAST HOSPITAL	SAN FRANCISCO	N/A	28	0.10%	0	0.00%
SAN FRANCISCO GENERAL HOSP MED CTR	SAN FRANCISCO	N/A	12,393	42.81%	781	34.66%
SAN MATEO GENERAL HOSPITAL	SAN MATEO	N/A	1,323	4.57%	790	35.06%
SEQUOIA HOSPITAL	SAN MATEO	CATHOLIC HEALTHCARE WEST	426	1.47%	0	0.00%
SETON MEDICAL CENTER	SAN MATEO	CATHOLIC HEALTHCARE WEST	1,649	5.70%	0	0.00%
SETON MEDICAL CENTER - COASTSIDE	SAN MATEO	CATHOLIC HEALTHCARE WEST	51	0.18%	0	0.00%
ST. FRANCIS MEMORIAL HOSPITAL	SAN FRANCISCO	CATHOLIC HEALTHCARE WEST	991	3.42%	0	0.00%
ST. LUKE'S HOSPITAL	SAN FRANCISCO	N/A	1,690	5.84%	0	0.00%
ST. MARY'S MEDICAL CENTER SAN FRANCISCO	SAN FRANCISCO	CATHOLIC HEALTHCARE WEST	1,192	4.12%	0	0.00%
UC SAN FRANCISCO (**Includes UCSF's 3 hospitals)	SAN FRANCISCO	UNIVERSITY OF CALIFORNIA	3,989	13.78%	231	10.25%
		<b>Total</b>	<b>28,947</b>	<b>100.00%</b>	<b>2,253</b>	<b>100.00%</b>
		<b>Median</b>	<b>418</b>	<b>1.44%</b>	<b>0</b>	<b>0.00%</b>

**Figure N-5.**  
**Los Angeles County Health Services Area Medi-Cal and Indigent Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	MEDI-CAL DISCHARGES	SHARE OF TOTAL MEDI-CAL DISCHARGES	INDIGENT (COUNTY & OTHER INDIGENT) DISCHARGES	SHARE OF TOTAL INDIGENT DISCHARGES
ALHAMBRA HOSPITAL - ALHAMBRA	LOS ANGELES	N/A	854	0.39%	0	0.00%
AMERICAN RECOVERY CENTER	LOS ANGELES	N/A	0	0.00%	1,727	3.54%
ANTELOPE VALLEY HOSPITAL MEDICAL CTR	LOS ANGELES	N/A	5,296	2.42%	0	0.00%
AURORA CHARTER OAK	LOS ANGELES	N/A	251	0.11%	288	0.59%
AVALON MUNICIPAL HOSPITAL & CLINIC	LOS ANGELES	N/A	19	0.01%	0	0.00%
BARLOW HOSPITAL	LOS ANGELES	N/A	84	0.04%	0	0.00%
BELLFLOWER MEDICAL CENTER	LOS ANGELES	PACIFIC HEALTH CORPORATION	2,078	0.95%	0	0.00%
BEVERLY HOSPITAL	LOS ANGELES	N/A	3,736	1.71%	125	0.26%
BHC ALHAMBRA HOSPITAL	LOS ANGELES	BEHAVIORAL HEALTHCARE CORP	1,047	0.48%	0	0.00%
CALIFORNIA HOSPITAL MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	7,401	3.39%	2	0.00%
CEDARS-SINAI MEDICAL CENTER	LOS ANGELES	N/A	4,239	1.94%	417	0.85%
CHARTER BHS - COVINA	LOS ANGELES	N/A	484	0.22%	713	1.46%
CHILDREN'S HOSPITAL OF LOS ANGELES	LOS ANGELES	N/A	7,877	3.61%	1	0.00%
CITRUS VALLEY MEDICAL CENTER-QV CAMPUS	LOS ANGELES	N/A	7,285	3.34%	0	0.00%
CITY OF ANGELS MEDICAL CENTER	LOS ANGELES	N/A	1,904	0.87%	0	0.00%
CITY OF HOPE NATIONAL MEDICAL CENTER	LOS ANGELES	N/A	1,084	0.50%	2	0.00%
COAST PLAZA DOCTORS HOSPITAL	LOS ANGELES	N/A	1,358	0.62%	0	0.00%
COLLEGE HOSPITAL	LOS ANGELES	N/A	976	0.45%	0	0.00%
COLUMBIA LAS ENCINAS HOSPITAL	LOS ANGELES	COLUMBIA/HCA HEALTHCARE CORP	147	0.07%	0	0.00%
COMMUNITY HOSPITAL OF GARDENA	LOS ANGELES	N/A	0	0.00%	0	0.00%
DANIEL FREEMAN MARINA HOSPITAL	LOS ANGELES	N/A	601	0.28%	0	0.00%
DANIEL FREEMAN MEMORIAL HOSPITAL	LOS ANGELES	N/A	4,630	2.12%	0	0.00%
DEL AMO HOSPITAL	LOS ANGELES	N/A	608	0.28%	0	0.00%
DOCTORS HOSPITAL OF WEST COVINA	LOS ANGELES	N/A	135	0.06%	0	0.00%
DOWNEY COMMUNITY HOSPITAL	LOS ANGELES	N/A	1,745	0.80%	0	0.00%
EARL & LORRAINE MILLER CHILDRENS HOSP	LOS ANGELES	N/A	1,874	0.86%	0	0.00%
EAST LOS ANGELES DOCTOR'S HOSPITAL	LOS ANGELES	N/A	1,085	0.50%	9	0.02%
ENCINO TARZANA RGNL MC - ENCINO	LOS ANGELES	TENET HEALTHCARE CORP	237	0.11%	0	0.00%
FOOTHILL PRESBYTERIAN HOSPITAL	LOS ANGELES	N/A	560	0.26%	0	0.00%
GATEWAYS HOSPITAL AND MENTAL HEALTH CTR	LOS ANGELES	N/A	225	0.10%	0	0.00%
GLENDALE ADVENTIST MEDICAL CENTER	LOS ANGELES	ADVENTIST HEALTH	4,282	1.96%	0	0.00%
GLENDALE MEMORIAL HOSPITAL & HEALTH CTR	LOS ANGELES	CATHOLIC HEALTHCARE WEST	4,542	2.08%	0	0.00%
GOOD SAMARITAN HOSPITAL	LOS ANGELES	N/A	2,349	1.08%	0	0.00%
GRANADA HILLS COMMUNITY HOSPITAL	LOS ANGELES	N/A	1,429	0.65%	11	0.02%
HENRY MAYO NEWHALL MEMORIAL HOSPITAL	LOS ANGELES	N/A	634	0.29%	123	0.25%
HUNTINGTON EAST VALLEY HOSPITAL	LOS ANGELES	N/A	1,424	0.65%	0	0.00%
HUNTINGTON MEMORIAL HOSPITAL	LOS ANGELES	N/A	3,099	1.42%	36	0.07%
KAISER FDN HOSP - BELLFLOWER	LOS ANGELES	N/A	87	0.04%	0	0.00%
KAISER FDN HOSP - HARBOR CITY	LOS ANGELES	N/A	71	0.03%	0	0.00%

## N. Utilization Statistics for Aging and Poor Population, FY 2000

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	MEDI-CAL DISCHARGES	SHARE OF TOTAL MEDI-CAL DISCHARGES	INDIGENT (COUNTY & OTHER INDIGENT) DISCHARGES	SHARE OF TOTAL INDIGENT DISCHARGES
KAISER FDN HOSP - PANORAMA CITY	LOS ANGELES	N/A	31	0.01%	0	0.00%
KAISER FDN HOSP - SUNSET	LOS ANGELES	N/A	88	0.04%	0	0.00%
KAISER FDN HOSP - WEST LA	LOS ANGELES	N/A	71	0.03%	0	0.00%
KAISER FDN HOSP - WOODLAND HILLS	LOS ANGELES	N/A	13	0.01%	0	0.00%
KAISER FND HOSP - BALDWIN PARK	LOS ANGELES	N/A	41	0.02%	0	0.00%
KAISER FOUNDATION SOUTHERN REGION	LOS ANGELES	N/A	0	0.00%	0	0.00%
KEDREN COMMUNITY MENTAL HEALTH CENTER	LOS ANGELES	N/A	0	0.00%	0	0.00%
LA CASA PSYCHIATRIC HEALTH FACILITY	LOS ANGELES	N/A	94	0.04%	212	0.43%
LAC/HARBOR+UCLA MEDICAL CTR	LOS ANGELES	COUNTY OF LOS ANGELES	10,011	4.58%	8,794	18.02%
LAC/HIGH DESERT HOSPITAL	LOS ANGELES	COUNTY OF LOS ANGELES	1,014	0.46%	622	1.27%
LAC/MARTIN LUTHER KING JR/DREW MED CTR	LOS ANGELES	COUNTY OF LOS ANGELES	8,427	3.86%	4,145	8.50%
LAC/OLIVE VIEW MEDICAL CENTER	LOS ANGELES	COUNTY OF LOS ANGELES	6,776	3.10%	6,019	12.34%
LAC/RANCHO LOS AMIGOS NATIONAL REHAB CTR	LOS ANGELES	COUNTY OF LOS ANGELES	2,156	0.99%	655	1.34%
LAC/USC MEDICAL CENTER	LOS ANGELES	COUNTY OF LOS ANGELES	18,706	8.56%	22,057	45.21%
LANCASTER COMMUNITY HOSPITAL	LOS ANGELES	N/A	206	0.09%	0	0.00%
LITTLE COMPANY OF MARY HOSPITAL	LOS ANGELES	N/A	1,449	0.66%	0	0.00%
LONG BEACH COMMUNITY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	1,885	0.86%	0	0.00%
LONG BEACH MEMORIAL MEDICAL CENTER	LOS ANGELES	MEMORIAL HEALTH SERVICES	2,871	1.31%	0	0.00%
LOS ANGELES COMMUNITY HOSPITAL	LOS ANGELES	N/A	3,604	1.65%	0	0.00%
LOS ANGELES METROPOLITAN MEDICAL CENTER	LOS ANGELES	PACIFIC HEALTH CORPORATION	3,611	1.65%	0	0.00%
MEMORIAL HOSPITAL OF GARDENA	LOS ANGELES	N/A	1,337	0.61%	79	0.16%
METHODIST HOSPITAL OF SOUTHERN CAL	LOS ANGELES	N/A	1,324	0.61%	0	0.00%
MISSION COMMUNITY HOSPITAL - PANORAMA	LOS ANGELES	N/A	2,185	1.00%	0	0.00%
MONROVIA COMMUNITY HOSPITAL	LOS ANGELES	N/A	571	0.26%	0	0.00%
MOTION PICTURE & TELEVISION HOSPITAL	LOS ANGELES	N/A	112	0.05%	0	0.00%
NORTHRIDGE HOSPITAL MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	2,733	1.25%	3	0.01%
NORTHRIDGE HOSPITAL MEDICAL CTR-SHERMAN	LOS ANGELES	CATHOLIC HEALTHCARE WEST	3,540	1.62%	1	0.00%
ORTHOPAEDIC HOSPITAL	LOS ANGELES	N/A	669	0.31%	0	0.00%
PACIFIC ALLIANCE MEDICAL CENTER	LOS ANGELES	N/A	2,764	1.27%	0	0.00%
PACIFIC HOSPITAL OF LONG BEACH	LOS ANGELES	N/A	2,979	1.36%	0	0.00%
PACIFICA HOSPITAL OF THE VALLEY	LOS ANGELES	N/A	2,767	1.27%	0	0.00%
PINE GROVE HOSPITAL	LOS ANGELES	N/A	572	0.26%	0	0.00%
POMONA VALLEY HOSPITAL MEDICAL CENTER	LOS ANGELES	N/A	7,731	3.54%	2	0.00%
PRESBYTERIAN INTERCOMMUNITY HOSPITAL	LOS ANGELES	N/A	2,857	1.31%	0	0.00%
PROVIDENCE HOLY CROSS MEDICAL CENTER	LOS ANGELES	N/A	1,536	0.70%	91	0.19%
PROVIDENCE SAINT JOSEPH MEDICAL CENTER	LOS ANGELES	N/A	2,180	1.00%	0	0.00%
ROBERT F. KENNEDY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	2,491	1.14%	0	0.00%
SAN DIMAS COMMUNITY HOSPITAL	LOS ANGELES	TENET HEALTHCARE CORP	357	0.16%	0	0.00%
SAN GABRIEL VALLEY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	1,624	0.74%	7	0.01%
SAN PEDRO PENINSULA HOSPITAL	LOS ANGELES	N/A	981	0.45%	0	0.00%
SAN VICENTE HOSPITAL	LOS ANGELES	N/A	106	0.05%	0	0.00%
SANTA MARTA HOSPITAL	LOS ANGELES	N/A	1,584	0.73%	0	0.00%

## N. Utilization Statistics for Aging and Poor Population, FY 2000



FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	MEDI-CAL DISCHARGES	SHARE OF TOTAL MEDI-CAL DISCHARGES	INDIGENT (COUNTY & OTHER INDIGENT) DISCHARGES	SHARE OF TOTAL INDIGENT DISCHARGES
SANTA TERESITA HOSPITAL	LOS ANGELES	N/A	695	0.32%	0	0.00%
SHERMAN OAKS HOSPITAL & HEALTH CENTER	LOS ANGELES	N/A	215	0.10%	0	0.00%
SHRINERS HOSPITAL - LOS ANGELES	LOS ANGELES	N/A	0	0.00%	0	0.00%
SPECIALTY HOSPITAL OF SOUTHERN CAL	LOS ANGELES	N/A	2	0.00%	0	0.00%
ST. FRANCIS MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	10,851	4.97%	21	0.04%
ST. MARY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	4,188	1.92%	0	0.00%
ST. VINCENT MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	1,337	0.61%	0	0.00%
STAR VIEW ADOLESCENT - PHF	LOS ANGELES	N/A	0	0.00%	0	0.00%
TARZANA TREATMENT CENTER	LOS ANGELES	N/A	0	0.00%	1,467	3.01%
TEMPLE COMMUNITY HOSPITAL	LOS ANGELES	N/A	911	0.42%	0	0.00%
TOM REDGATE MEMORIAL RECOVERY CENTER	LOS ANGELES	N/A	0	0.00%	1,052	2.16%
TORRANCE MEMORIAL MEDICAL CENTER	LOS ANGELES	N/A	1,668	0.76%	0	0.00%
TRI-CITY REGIONAL MEDICAL CENTER	LOS ANGELES	N/A	0	0.00%	0	0.00%
UCLA (**Includes UCLA's 3 hospitals)	LOS ANGELES	UNIVERSITY OF CALIFORNIA	5,548	2.54%	104	0.21%
USC KENNETH NORRIS JR. CANCER HOSPITAL	LOS ANGELES	N/A	0	0.00%	0	0.00%
VALLEY PRESBYTERIAN HOSPITAL	LOS ANGELES	N/A	5,671	2.60%	0	0.00%
VENCOR HOSPITAL - LOS ANGELES	LOS ANGELES	VENCOR INC	48	0.02%	5	0.01%
VERDUGO HILLS HOSPITAL	LOS ANGELES	N/A	164	0.08%	0	0.00%
WEST HILLS HOSPITAL & MEDICAL CENTER	LOS ANGELES	COLUMBIA/HCA HEALTHCARE CORP	115	0.05%	0	0.00%
WHITE MEMORIAL MEDICAL CENTER	LOS ANGELES	ADVENTIST HEALTH	7,201	3.30%	3	0.01%
		<b>TOTAL</b>	<b>218,405</b>	<b>100.00%</b>	<b>48,793</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>1,085</b>	<b>0.50%</b>	<b>0</b>	<b>0.00%</b>

**Figure N-6.**  
**Orange County Health Services Area Medi-Cal and Indigent Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	MEDI-CAL DISCHARGES	SHARE OF TOTAL MEDI-CAL DISCHARGES	INDIGENT (COUNTY & OTHER INDIGENT) DISCHARGES	SHARE OF TOTAL INDIGENT DISCHARGES
ANAHEIM GENERAL HOSPITAL	ORANGE	PACIFIC HEALTH CORPORATION	1,108	4.37%	41	0.96%
ANAHEIM MEMORIAL MEDICAL CENTER	ORANGE	MEMORIAL HEALTH SERVICES	1,228	4.84%	32	0.75%
BREA COMMUNITY HOSPITAL	ORANGE	N/A	104	0.41%	2	0.05%
CHAPMAN MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	217	0.86%	64	1.50%
CHILDREN'S HOSPITAL AT MISSION	ORANGE	N/A	314	1.24%	0	0.00%
CHILDREN'S HOSPITAL OF ORANGE COUNTY	ORANGE	N/A	1,811	7.14%	0	0.00%
COLLEGE HOSPITAL COSTA MESA	ORANGE	N/A	1,533	6.04%	0	0.00%
FOUNTAIN VALLEY RGNL HOSP & MC-EUCLID	ORANGE	TENET HEALTHCARE CORP	4,469	17.61%	522	12.23%
GARDEN GROVE HOSP & MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	2,271	8.95%	161	3.77%
HEALTHBRIDGE CHILDRENS REHAB HOSPITAL	ORANGE	N/A	11	0.04%	0	0.00%
HOAG MEMORIAL HOSPITAL PRESBYTERIAN	ORANGE	N/A	492	1.94%	168	3.94%
HUNTINGTON BEACH HOSPITAL	ORANGE	N/A	396	1.56%	68	1.59%
IRVINE MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	134	0.53%	68	1.59%
LA PALMA INTERCOMMUNITY HOSPITAL	ORANGE	N/A	113	0.45%	15	0.35%
MISSION HOSPITAL REGIONAL MEDICAL CENTER	ORANGE	ST. JOSEPH HEALTH SYSTEM	1,113	4.39%	198	4.64%
ORANGE COAST MEMORIAL MEDICAL CENTER	ORANGE	MEMORIAL HEALTH SERVICES	93	0.37%	10	0.23%
ORANGE COUNTY COMM HOSP - BUENA PARK	ORANGE	N/A	381	1.50%	0	0.00%
SADDLEBACK MEMORIAL MEDICAL CENTER	ORANGE	MEMORIAL HEALTH SERVICES	199	0.78%	128	3.00%
SAN CLEMENTE HOSPITAL & MED CTR	ORANGE	N/A	105	0.41%	30	0.70%
SOUTH COAST MEDICAL CENTER	ORANGE	ADVENTIST HEALTH	81	0.32%	0	0.00%
ST. JOSEPH HOSPITAL - ORANGE	ORANGE	N/A	1,557	6.14%	938	21.98%
ST. JUDE MEDICAL CENTER	ORANGE	ST. JOSEPH HEALTH SYSTEM	1,236	4.87%	187	4.38%
TUSTIN HOSPITAL MEDICAL CENTER	ORANGE	PACIFIC HEALTH CORPORATION	244	0.96%	0	0.00%
UC IRVINE	ORANGE	UNIVERSITY OF CALIFORNIA	5,785	22.80%	1,466	34.36%
VENCOR HOSPITAL - BREA	ORANGE	VENCOR INC	0	0.00%	0	0.00%
VENCOR HOSPITAL - ORANGE COUNTY	ORANGE	VENCOR INC	45	0.18%	0	0.00%
WEST ANAHEIM MEDICAL CENTER	ORANGE	N/A	310	1.22%	169	3.96%
KAISER FDN HOSP - ANAHEIM	ORANGE	N/A	21	0.08%	0	0.00%
<b>TOTAL</b>			<b>25,371</b>	<b>100.00%</b>	<b>4,267</b>	<b>100.00%</b>
<b>MEDIAN</b>			<b>312</b>	<b>1.23%</b>	<b>31</b>	<b>0.73%</b>

**Figure N-7.  
San Diego/Imperial Health Services Area Medi-Cal and Indigent Discharges**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	MEDI-CAL DISCHARGES	SHARE OF TOTAL MEDI-CAL DISCHARGES	INDIGENT (COUNTY & OTHER INDIGENT) DISCHARGES	SHARE OF TOTAL INDIGENT DISCHARGES
ALVARADO PARKWAY INSTITUTE BHS	SAN DIEGO	N/A	5	0.01%	0	0.00%
AURORA SAN DIEGO	SAN DIEGO	N/A	130	0.29%	2	0.04%
BAYVIEW HOSPITAL & MENTAL HEALTH SYSTEM	SAN DIEGO	N/A	232	0.51%	0	0.00%
CHARTER ALVARADO BEHAVIORAL HLTH SYSTEM	SAN DIEGO	N/A	7	0.02%	122	2.18%
CHARTER HOSPITAL OF SAN DIEGO	SAN DIEGO	N/A	294	0.64%	20	0.36%
CHILDREN'S HOSPITAL - SAN DIEGO	SAN DIEGO	N/A	5,102	11.19%	0	0.00%
CONTINENTAL REHAB HOSP FOR SAN DIEGO	SAN DIEGO	SUN HEALTHCARE GROUP INC.	0	0.00%	0	0.00%
EL CENTRO REGIONAL MEDICAL CENTER	IMPERIAL	N/A	1,687	3.70%	201	3.58%
FALLBROOK HOSPITAL DISTRICT	SAN DIEGO	N/A	244	0.53%	0	0.00%
GROSSMONT HOSPITAL	SAN DIEGO	SAN DIEGO HOSPITAL ASSN.	3,461	7.59%	541	9.65%
KAISER FDN HOSP - SAN DIEGO	SAN DIEGO	N/A	77	0.17%	0	0.00%
MISSION BAY HOSPITAL	SAN DIEGO	N/A	44	0.10%	55	0.98%
PALOMAR MEDICAL CENTER	SAN DIEGO	N/A	3,078	6.75%	33	0.59%
PARADISE VALLEY HOSPITAL	SAN DIEGO	ADVENTIST HEALTH	3,753	8.23%	438	7.81%
PIONEERS MEMORIAL HOSPITAL	IMPERIAL	N/A	1,664	3.65%	197	3.51%
POMERADO HOSPITAL	SAN DIEGO	N/A	448	0.98%	4	0.07%
SAN DIEGO COUNTY PSYCHIATRIC HOSPITAL	SAN DIEGO	N/A	168	0.37%	363	6.47%
SAN DIEGO HOSPICE ACUTE CARE CENTER	SAN DIEGO	N/A	118	0.26%	0	0.00%
SCRIPPS GREEN HOSPITAL	SAN DIEGO	CATHOLIC HEALTHCARE WEST	198	0.43%	2	0.04%
SCRIPPS MEMORIAL HOSPITAL - CHULA VISTA	SAN DIEGO	CATHOLIC HEALTHCARE WEST	1,824	4.00%	190	3.39%
SCRIPPS MEMORIAL HOSPITAL - ENCINITAS	SAN DIEGO	CATHOLIC HEALTHCARE WEST	703	1.54%	146	2.60%
SCRIPPS MEMORIAL HOSPITAL - LA JOLLA	SAN DIEGO	CATHOLIC HEALTHCARE WEST	334	0.73%	248	4.42%
SCRIPPS MERCY HOSPITAL	SAN DIEGO	CATHOLIC HEALTHCARE WEST	4,339	9.51%	787	14.04%
SHARP CABRILLO HOSPITAL	SAN DIEGO	SAN DIEGO HOSPITAL ASSN.	50	0.11%	0	0.00%
SHARP CHULA VISTA MEDICAL CENTER	SAN DIEGO	SAN DIEGO HOSPITAL ASSN.	2,683	5.88%	179	3.19%
SHARP CORONADO HOSPITAL & HEALTHCARE CTR	SAN DIEGO	SAN DIEGO HOSPITAL ASSN.	376	0.82%	18	0.32%
SHARP MARY BIRCH HOSPITAL FOR WOMEN	SAN DIEGO	SAN DIEGO HOSPITAL ASSN.	2,373	5.20%	9	0.16%
SHARP MEMORIAL HOSPITAL	SAN DIEGO	SAN DIEGO HOSPITAL ASSN.	2,270	4.98%	457	8.15%
SHARP VISTA PACIFICA	SAN DIEGO	SAN DIEGO HOSPITAL ASSN.	0	0.00%	0	0.00%
TRI-CITY MEDICAL CENTER	SAN DIEGO	N/A	2,316	5.08%	0	0.00%
UC SAN DIEGO (**Includes UCSD's 2 hospitals)	SAN DIEGO	UNIVERSITY OF CALIFORNIA	5,822	12.76%	1,556	27.75%
VENCOR HOSPITAL - SAN DIEGO	SAN DIEGO	VENCOR INC	559	1.23%	0	0.00%
VILLA VIEW COMMUNITY HOSPITAL	SAN DIEGO	N/A	1,253	2.75%	39	0.70%
		<b>TOTAL</b>	<b>45,612</b>	<b>100.00%</b>	<b>5,607</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>448</b>	<b>0.98%</b>	<b>20</b>	<b>0.36%</b>





## O. Regional ER Utilization Statistics

Appendix O figures include only GAC facilities that had EMS utilization.

Source: OSHPD Annual Hospital Utilization Data Report, 2000.

**Figure O-1.**  
**Golden Empire Health Services Area ER Visits**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	ER VISITS	SHARE OF TOTAL ER VISITS
BARTON MEMORIAL HOSPITAL	EL DORADO	N/A	20,982	3.30%
KAISER FOUNDATION HOSPITAL - SACRAMENTO	SACRAMENTO	KAISER FOUNDATION HOSPITALS	79,765	12.53%
KAISER FOUNDATION HOSPITAL - SOUTH SACRAMENTO	SACRAMENTO	KAISER FOUNDATION HOSPITALS	35,652	5.60%
KAISER FOUNDATION HOSPITAL - VALLEY MED CENTER	PLACER	KAISER FOUNDATION HOSPITALS	63,948	10.05%
MARSHALL HOSPITAL	EL DORADO	N/A	22,587	3.55%
MERCY GENERAL HOSPITAL	SACRAMENTO	CATHOLIC HEALTHCARE WEST	28,427	4.47%
MERCY HOSPITAL - FOLSOM	SACRAMENTO	CATHOLIC HEALTHCARE WEST	17,873	2.81%
MERCY SAN JUAN HOSPITAL	SACRAMENTO	CATHOLIC HEALTHCARE WEST	51,736	8.13%
METHODIST HOSPITAL OF SACRAMENTO	SACRAMENTO	CATHOLIC HEALTHCARE WEST	30,499	4.79%
RIDEOUT MEMORIAL HOSPITAL	YUBA	N/A	28,911	4.54%
SIERRA NEVADA MEMORIAL HOSPITAL	NEVADA	CATHOLIC HEALTHCARE WEST	28,927	4.54%
SIERRA VALLEY DISTRICT HOSPITAL	SIERRA	N/A	596	0.09%
SUTTER AUBURN FAITH HOSPITAL	PLACER	SUTTER HEALTH	19,513	3.07%
SUTTER DAVIS HOSPITAL	YOLO	SUTTER HEALTH	16,253	2.55%
SUTTER GENERAL HOSPITAL	SACRAMENTO	SUTTER HEALTH	36,022	5.66%
SUTTER MEMORIAL HOSPITAL	SACRAMENTO	SUTTER HEALTH	21,714	3.41%
SUTTER ROSEVILLE MEDICAL CENTER	PLACER	SUTTER HEALTH	38,749	6.09%
TAHOE FOREST HOSPITAL	NEVADA	N/A	14,271	2.24%
UC DAVIS	SACRAMENTO	UNIVERSITY OF CALIFORNIA	64,037	10.06%
WOODLAND MEMORIAL HOSPITAL	YOLO	CATHOLIC HEALTHCARE WEST	16,133	2.53%
		<b>TOTAL</b>	<b>636,595</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>28,669</b>	<b>4.50%</b>

**Figure O-2.**  
**West Bay Health Services Area ER Visits**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	ER VISITS	SHARE OF TOTAL ER VISITS
CALIFORNIA PACIFIC MEDICAL CENTER - DAVIES CAMPUS	SAN FRANCISCO	SUTTER HEALTH	13,018	2.71%
CALIFORNIA PACIFIC MEDICAL CENTER - PACIFIC CAMPUS	SAN FRANCISCO	SUTTER HEALTH	34,468	7.17%
CHINESE HOSPITAL	SAN FRANCISCO	N/A	4,737	0.99%
KAISER FOUNDATION HOSPITAL - GEARY S F	SAN FRANCISCO	KAISER FOUNDATION HOSPITALS	32,337	6.73%
KAISER FOUNDATION HOSPITAL - REDWOOD CITY	SAN MATEO	KAISER FOUNDATION HOSPITALS	28,265	5.88%
KAISER FOUNDATION HOSPITAL - SAN RAFAEL	MARIN	KAISER FOUNDATION HOSPITALS	27,827	5.79%
KAISER FOUNDATION HOSPITAL - SO SAN FRANCISCO	SAN MATEO	KAISER FOUNDATION HOSPITALS	34,460	7.17%
MARIN GENERAL HOSPITAL	MARIN	SUTTER HEALTH	29,517	6.14%
MILLS PENINSULA HEALTH CENTER	SAN MATEO	SUTTER HEALTH	17,003	3.54%
MILLS-PENINSULA MEDICAL CENTER	SAN MATEO	SUTTER HEALTH	22,452	4.67%
NOVATO COMMUNITY HOSPITAL	MARIN	SUTTER HEALTH	11,490	2.39%
SAN FRANCISCO GENERAL HOSPITAL	SAN FRANCISCO	N/A	60,777	12.65%
SAN MATEO CO. GENERAL HOSPITAL	SAN MATEO	N/A	23,052	4.80%
SEQUOIA HOSPITAL	SAN MATEO	CATHOLIC HEALTHCARE WEST	21,304	4.43%
SETON MEDICAL CENTER	SAN MATEO	CATHOLIC HEALTHCARE WEST	25,984	5.41%
SETON MEDICAL CENTER - COASTSIDE	SAN MATEO	CATHOLIC HEALTHCARE WEST	3,493	0.73%
ST. FRANCIS MEMORIAL HOSPITAL - SAN FRANCISCO	SAN FRANCISCO	CATHOLIC HEALTHCARE WEST	18,853	3.92%
ST. LUKE'S HOSPITAL	SAN FRANCISCO	N/A	23,628	4.92%
ST. MARY'S MEDICAL CENTER - SAN FRANCISCO	SAN FRANCISCO	CATHOLIC HEALTHCARE WEST	13,664	2.84%
UC SAN FRANCISCO	SAN FRANCISCO	UCSF STANFORD HEALTH CARE	34,149	7.11%
		<b>TOTAL</b>	<b>480,478</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>23,340</b>	<b>4.86%</b>

## O. Regional ER Utilization Statistics

**Figure O-3.**  
**Los Angeles County Health Services Area ER Visits**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	ER VISITS	SHARE OF TOTAL ER VISITS
ALHAMBRA HOSPITAL	LOS ANGELES	N/A	13,101	0.48%
ANTELOPE VALLEY HOSPITAL MEDICAL CENTER	LOS ANGELES	N/A	62,867	2.32%
AVALON MUNICIPAL HOSPITAL	LOS ANGELES	N/A	1,535	0.06%
BELLFLOWER MEDICAL CENTER	LOS ANGELES	PACIFIC HEALTH CORP	8,442	0.31%
BELLWOOD GENERAL HOSPITAL	LOS ANGELES	N/A	5,915	0.22%
BEVERLY HOSPITAL	LOS ANGELES	N/A	27,055	1.00%
BROTMAN MEDICAL CENTER	LOS ANGELES	TENET HEALTHCARE CORP	21,599	0.80%
CALIFORNIA HOSPITAL MEDICAL CENTER - LOS ANGELES	LOS ANGELES	CATHOLIC HEALTHCARE WEST	40,288	1.49%
CEDARS SINAI MEDICAL CENTER	LOS ANGELES	N/A	77,301	2.86%
CENTINELA HOSPITAL MEDICAL CENTER	LOS ANGELES	TENET HEALTHCARE CORP	34,284	1.27%
CENTURY CITY HOSPITAL	LOS ANGELES	TENET HEALTHCARE CORP	10,285	0.38%
CHILDREN'S HOSPITAL OF LOS ANGELES	LOS ANGELES	N/A	49,577	1.83%
CITRUS VALLEY MEDICAL CENTER - IC CAMPUS	LOS ANGELES	N/A	10,507	0.39%
CITRUS VALLEY MEDICAL CENTER - QV CAMPUS	LOS ANGELES	N/A	17,814	0.66%
COAST PLAZA DOCTORS HOSPITAL	LOS ANGELES	N/A	12,736	0.47%
COMMUNITY & MISSION HSP OF HNTG PARK - SLAUSON	LOS ANGELES	TENET HEALTHCARE CORP	7,278	0.27%
DANIEL FREEMAN MARINA HOSPITAL	LOS ANGELES	N/A	19,960	0.74%
DANIEL FREEMAN MEMORIAL HOSPITAL	LOS ANGELES	N/A	40,626	1.50%
DOWNEY REGIONAL MEDICAL CENTER	LOS ANGELES	N/A	34,711	1.28%
EAST LOS ANGELES DOCTORS HOSPITAL	LOS ANGELES	N/A	9,965	0.37%
ENCINO-TARZANA REGIONAL MED CTR-ENCINO	LOS ANGELES	TENET HEALTHCARE CORP	9,016	0.33%
ENCINO-TARZANA REGIONAL MED CTR-TARZANA	LOS ANGELES	TENET HEALTHCARE CORP	24,100	0.89%
FOOTHILL PRESBYTERIAN HOSPITAL - JOHNSTON MEMORIAL	LOS ANGELES	N/A	19,592	0.72%
GARFIELD MEDICAL CENTER	LOS ANGELES	TENET HEALTHCARE CORP	21,245	0.78%
GLENDALE ADVENTIST MEDICAL CENTER - WILSON TERRACE	LOS ANGELES	ADVENTIST HEALTH	31,286	1.16%
GLENDALE MEMORIAL HOSPITAL & HEALTH CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	25,128	0.93%
GOOD SAMARITAN HOSPITAL - LOS ANGELES	LOS ANGELES	N/A	16,107	0.59%
GRANADA HILLS COMMUNITY HOSPITAL	LOS ANGELES	N/A	13,617	0.50%
GREATER EL MONTE COMMUNITY HOSPITAL	LOS ANGELES	TENET HEALTHCARE CORP	12,915	0.48%
HENRY MAYO NEWHALL MEMORIAL HOSPITAL	LOS ANGELES	N/A	30,880	1.14%
HUNTINGTON EAST VALLEY HOSPITAL	LOS ANGELES	N/A	8,313	0.31%
HUNTINGTON MEMORIAL HOSPITAL	LOS ANGELES	N/A	49,475	1.83%
KAISER FOUNDATION HOSPITAL - BALDWIN PARK	LOS ANGELES	KAISER FOUNDATION HOSPITALS	93,601	3.46%
KAISER FOUNDATION HOSPITAL - BELLFLOWER	LOS ANGELES	KAISER FOUNDATION HOSPITALS	122,668	4.53%
KAISER FOUNDATION HOSPITAL - HARBOR CITY	LOS ANGELES	KAISER FOUNDATION HOSPITALS	77,850	2.88%
KAISER FOUNDATION HOSPITAL - PANORAMA CITY	LOS ANGELES	KAISER FOUNDATION HOSPITALS	38,929	1.44%
KAISER FOUNDATION HOSPITAL - SUNSET	LOS ANGELES	KAISER FOUNDATION HOSPITALS	16,472	0.61%
KAISER FOUNDATION HOSPITAL - WEST LA	LOS ANGELES	KAISER FOUNDATION HOSPITALS	76,744	2.83%
KAISER FOUNDATION HOSPITAL - WOODLAND HILLS	LOS ANGELES	KAISER FOUNDATION HOSPITALS	34,861	1.29%
LAKEWOOD REGIONAL MEDICAL CENTER - SOUTH STREET	LOS ANGELES	TENET HEALTHCARE CORP	27,283	1.01%
LANCASTER COMMUNITY HOSPITAL	LOS ANGELES	N/A	15,733	0.58%
LITTLE COMPANY OF MARY HOSPITAL	LOS ANGELES	N/A	42,070	1.55%

## O. Regional ER Utilization Statistics

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	ER VISITS	SHARE OF TOTAL ER VISITS
LONG BEACH MEMORIAL MEDICAL CENTER	LOS ANGELES	MEMORIAL HEALTH SERVICES	56,789	2.10%
LOS ANGELES CO HARBOR - UCLA MEDICAL CENTER	LOS ANGELES	COUNTY OF LOS ANGELES	75,554	2.79%
LOS ANGELES CO MARTIN LUTHER KING JR/DREW MED CTR	LOS ANGELES	COUNTY OF LOS ANGELES	79,027	2.92%
LOS ANGELES CO OLIVE VIEW MEDICAL CENTER	LOS ANGELES	COUNTY OF LOS ANGELES	82,721	3.06%
LOS ANGELES CO USC MEDICAL CENTER	LOS ANGELES	COUNTY OF LOS ANGELES	201,279	7.43%
LOS ANGELES COMMUNITY HOSPITAL	LOS ANGELES	N/A	5,195	0.19%
MEMORIAL HOSPITAL OF GARDENA	LOS ANGELES	N/A	22,438	0.83%
METHODIST HOSPITAL OF SOUTHERN CALIFORNIA	LOS ANGELES	N/A	30,649	1.13%
MIDWAY HOSPITAL MEDICAL CENTER	LOS ANGELES	TENET HEALTHCARE CORP	13,163	0.49%
MISSION COMMUNITY HOSPITAL - PANORAMA CAMPUS	LOS ANGELES	N/A	10,412	0.38%
MONTEREY PARK HOSPITAL	LOS ANGELES	TENET HEALTHCARE CORP	6,964	0.26%
NORTHRIDGE HOSPITAL MEDICAL CENTER - ROSCOE	LOS ANGELES	CATHOLIC HEALTHCARE WEST	46,445	1.72%
NORTHRIDGE HOSPITAL MEDICAL CENTER - SHERMAN WAY	LOS ANGELES	CATHOLIC HEALTHCARE WEST	20,684	0.76%
NORWALK COMMUNITY HOSPITAL	LOS ANGELES	N/A	3,822	0.14%
ORTHOPAEDIC HOSPITAL	LOS ANGELES	N/A	12,354	0.46%
PACIFIC HOSPITAL OF LONG BEACH	LOS ANGELES	N/A	11,474	0.42%
PACIFICA HOSPITAL OF THE VALLEY	LOS ANGELES	N/A	16,271	0.60%
POMONA VALLEY HOSPITAL MEDICAL CENTER	LOS ANGELES	N/A	55,681	2.06%
PRESBYTERIAN INTERCOMMUNITY HOSPITAL	LOS ANGELES	N/A	47,170	1.74%
PROVIDENCE HOLY CROSS MEDICAL CENTER	LOS ANGELES	N/A	32,185	1.19%
PROVIDENCE SAINT JOSEPH MEDICAL CENTER	LOS ANGELES	N/A	46,000	1.70%
QUEEN OF ANGELS/HOLLYWOOD PRESBYTERIAN MED CENTER	LOS ANGELES	TENET HEALTHCARE CORP	31,187	1.15%
ROBERT F. KENNEDY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	24,097	0.89%
SAN DIMAS COMMUNITY HOSPITAL	LOS ANGELES	TENET HEALTHCARE CORP	15,107	0.56%
SAN GABRIEL VALLEY MEDICAL CENTER	LOS ANGELES	CATHOLIC HEALTHCARE WEST	21,105	0.78%
SAN PEDRO PENINSULA HOSPITAL	LOS ANGELES	N/A	21,784	0.80%
SANTA MARTA HOSPITAL	LOS ANGELES	N/A	11,579	0.43%
SANTA TERESITA HOSPITAL	LOS ANGELES	N/A	11,735	0.43%
SHERMAN OAKS HOSPITAL AND HEALTH CENTER	LOS ANGELES	N/A	12,053	0.45%
ST. FRANCIS MEDICAL CENTER - LYNWOOD	LOS ANGELES	CATHOLIC HEALTHCARE WEST	59,491	2.20%
ST. JOHN'S HOSPITAL & HEALTH CENTER	LOS ANGELES	N/A	24,969	0.92%
ST. LUKE MEDICAL CENTER	LOS ANGELES	TENET HEALTHCARE CORP	15,976	0.59%
ST. MARY MEDICAL CENTER - LONG BEACH	LOS ANGELES	CATHOLIC HEALTHCARE WEST	34,377	1.27%
SUBURBAN MEDICAL CENTER	LOS ANGELES	TENET HEALTHCARE CORP	17,284	0.64%
TORRANCE MEMORIAL MEDICAL CENTER	LOS ANGELES	N/A	45,008	1.66%
TRI-CITY REGIONAL MEDICAL CENTER	LOS ANGELES	N/A	4,217	0.16%
UCLA	LOS ANGELES	UNIVERSITY OF CALIFORNIA	41,064	1.52%
VALLEY PRESBYTERIAN HOSPITAL	LOS ANGELES	N/A	25,062	0.93%
VERDUGO HILLS HOSPITAL	LOS ANGELES	N/A	15,784	0.58%
WEST HILLS HOSPITAL & MEDICAL CENTER	LOS ANGELES	COLUMBIA / HCA HEALTHCARE CORP	28,792	1.06%
WHITE MEMORIAL MEDICAL CENTER	LOS ANGELES	ADVENTIST HEALTH	29,179	1.08%
WHITTIER HOSPITAL MEDICAL CENTER	LOS ANGELES	TENET HEALTHCARE CORP	27,512	1.02%
		<b>TOTAL</b>	<b>2,707,370</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>24,099</b>	<b>0.89%</b>

## O. Regional ER Utilization Statistics

**Figure O-4.**  
**Orange County Health Services Area ER Visits**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	ER VISITS	SHARE OF TOTAL ER VISITS
ANAHEIM GENERAL HOSPITAL	ORANGE	PACIFIC HEALTH CORP	8,791	1.28%
ANAHEIM MEMORIAL MEDICAL CENTER	ORANGE	MEMORIAL HEALTH SERVICES	41,430	6.01%
BREA COMMUNITY HOSPITAL	ORANGE	N/A	11,416	1.66%
CHAPMAN MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	9,867	1.43%
COASTAL COMMUNITIES HOSPITAL	ORANGE	TENET HEALTHCARE CORP	14,690	2.13%
FOUNTAIN VALLEY RGNL HOSP & MED CTR - EUCLID	ORANGE	TENET HEALTHCARE CORP	35,135	5.10%
GARDEN GROVE HOSPITAL & MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	21,441	3.11%
HOAG MEMORIAL HOSPITAL PRESBYTERIAN	ORANGE	N/A	53,531	7.77%
HUNTINGTON BEACH HOSPITAL	ORANGE	COLUMBIA / HCA HEALTHCARE CORP	18,761	2.72%
IRVINE MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	21,045	3.05%
KAISER FOUNDATION HOSPITAL - ANAHEIM	ORANGE	KAISER FOUNDATION HOSPITALS	49,340	7.16%
LA PALMA INTERCOMMUNITY HOSPITAL	ORANGE	N/A	16,468	2.39%
LOS ALAMITOS MEDICAL CENTER	ORANGE	TENET HEALTHCARE CORP	22,571	3.27%
MISSION HOSPITAL REGIONAL MEDICAL CENTER	ORANGE	ST JOSEPH HEALTH SYSTEM	47,564	6.90%
ORANGE COAST MEMORIAL MEDICAL CENTER	ORANGE	MEMORIAL HEALTH SERVICES	11,095	1.61%
PLACENTIA LINDA HOSPITAL	ORANGE	TENET HEALTHCARE CORP	16,438	2.38%
SADDLEBACK MEMORIAL MEDICAL CENTER	ORANGE	MEMORIAL HEALTH SERVICES	26,982	3.91%
SAN CLEMENTE HOSPITAL & MEDICAL CENTER	ORANGE	N/A	12,212	1.77%
SOUTH COAST MEDICAL CENTER	ORANGE	ADVENTIST HEALTH	12,735	1.85%
ST. JOSEPH HOSPITAL - ORANGE	ORANGE	N/A	86,167	12.50%
ST. JUDE MEDICAL CENTER	ORANGE	ST JOSEPH HEALTH SYSTEM	45,098	6.54%
UNIVERSITY OF CALIFORNIA IRVINE MEDICAL CENTER	ORANGE	UNIVERSTIY OF CALIFORNIA	41,992	6.09%
WEST ANAHEIM MEDICAL CENTER	ORANGE	COLUMBIA / HCA HEALTHCARE CORP	23,375	3.39%
WESTERN MEDICAL CENTER - SANTA ANA	ORANGE	TENET HEALTHCARE CORP	23,183	3.36%
WESTERN MEDICAL CENTER HOSPITAL - ANAHEIM	ORANGE	TENET HEALTHCARE CORP	17,922	2.60%
		<b>TOTAL</b>	<b>689,249</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>21,441</b>	<b>3.11%</b>

**Figure O-5.**  
**San Diego/Imperial Health Services Area ER Visits**

FACILITY (HOSPITAL/MEDICAL CENTER)	COUNTY	HEALTH SYSTEM	ER VISITS	SHARE OF TOTAL ER VISITS
ALVARADO HOSPITAL MEDICAL CENTER	SAN DIEGO	TENET HEALTHCARE CORP	19,570	2.89%
CHILDREN'S HOSPITAL - SAN DIEGO	SAN DIEGO	N/A	54,807	8.10%
EL CENTRO REGIONAL MEDICAL CENTER	IMPERIAL	N/A	28,395	4.20%
FALLBROOK HOSPITAL DISTRICT	SAN DIEGO	N/A	9,672	1.43%
GROSSMONT HOSPITAL	SAN DIEGO	SAN DIEGO HOSPITAL ASSOC	54,815	8.11%
KAISER FOUNDATION HOSPITAL - SAN DIEGO	SAN DIEGO	KAISER FOUNDATION HOSPITALS	113,441	16.78%
PALOMAR MEDICAL CENTER	SAN DIEGO	N/A	43,727	6.47%
PARADISE VALLEY HOSPITAL	SAN DIEGO	ADVENTIST HEALTH	31,391	4.64%
PIONEERS MEMORIAL HOSPITAL	IMPERIAL	N/A	20,837	3.08%
POMERADO HOSPITAL	SAN DIEGO	N/A	20,992	3.10%
SCRIPPS MEMORIAL HOSPITAL - CHULA VISTA	SAN DIEGO	CATHOLIC HEALTHCARE WEST	31,268	4.62%
SCRIPPS MEMORIAL HOSPITAL - ENCINITAS	SAN DIEGO	CATHOLIC HEALTHCARE WEST	23,483	3.47%
SCRIPPS MEMORIAL HOSPITAL - LA JOLLA	SAN DIEGO	CATHOLIC HEALTHCARE WEST	21,788	3.22%
SCRIPPS MERCY HOSPITAL	SAN DIEGO	CATHOLIC HEALTHCARE WEST	25,778	3.81%
SHARP CHULA VISTA MEDICAL CENTER	SAN DIEGO	SAN DIEGO HOSPITAL ASSOC	28,253	4.18%
SHARP CORONADO HOSPITAL AND HEALTHCARE CENTER	SAN DIEGO	SAN DIEGO HOSPITAL ASSOC	6,274	0.93%
SHARP MEMORIAL HOSPITAL	SAN DIEGO	SAN DIEGO HOSPITAL ASSOC	31,337	4.63%
TRI-CITY MEDICAL CENTER	SAN DIEGO	N/A	43,450	6.43%
UC San Diego AMC (**Includes the AMC's 2 GAC hospitals)	SAN DIEGO	UNIVERSTIY OF CALIFORNIA	58,653	8.67%
VILLA VIEW COMMUNITY HOSPITAL	SAN DIEGO	N/A	8,296	1.23%
		<b>TOTAL</b>	<b>676,227</b>	<b>100.00%</b>
		<b>MEDIAN</b>	<b>28,324</b>	<b>4.19%</b>

**VOLUME III.**  
**QUALITY OF LIFE IMPACTS:**  
**UC'S CULTURAL CONNECTIONS**





## Volume III. Preface

As a premier institution of higher education, the University of California has a wide spectrum of facilities and programs that create a rich environment for learning and discovery. But those places are also great public cultural resources. Open to children and adults around the state, UC campuses are great places to find a book, look at art, walk in the garden, explore the mysteries of the deep blue sea, or gaze at the stars millions of miles away.

Through its cultural and recreational programs, health care and community service activities, UC contributes to improving practically every aspect of the daily lives of Californians. If we consider its contributions across the board, it is no exaggeration to point out that there is no other institution in the state that benefits the quality of life of all Californians in every sphere of their daily life—learning, working, playing, living—more than the University of California.

From the public use of UC's libraries, cultural venues and recreational and athletic facilities to community participation in its outreach and youth education programs, most Californians' lives are directly and indirectly affected by UC's cultural resources every day. Through a myriad of campus programs, events and public engagements, UC provides community members with a wealth of resources and amenities that might not otherwise be available to them.

While it is virtually impossible to quantify the total impact of such amenities on people's lives, their extensive use is indicative of UC's "added value" in the community—both on and off campus.

These amenities are important for two reasons.

First, these amenities improve the physical and emotional life of Californians, provide them access to enriching activities and services, and help to create a "sense of place" in their communities, which further strengthens their own bonds to the community and to California.

Second, these amenities also provide California with a strategic advantage in attracting and retaining the best and brightest of skilled workers. These amenities are highly valued and sought out by today's "creative class"—the term coined for the estimated 30% upwardly mobile sector of the workforce that demands diverse cultural and recreational services, diversity and innovation in every sphere of life (see <http://www.washingtonmonthly.com/features/2001/0205.florida.html>). Not surprisingly, local economies tend to flourish and grow where these "creative" citizens congregate. Without the contributions of UC campuses, the vibrant and distinct personalities of their surrounding regions would likely be diminished.

UC's economic and health contributions to California's learning, working and living were documented in the two previous volumes. The following chapters will focus on illustrating UC's contributions to California's art and play, on its connections to the community's cultural and recreational life.

These chapters do, however, represent only the tip of the iceberg in documenting and evaluating UC's cultural connections. It is recommended that UC implement a systemwide tracking and monitoring system to capture these immense and increasingly important quality-of-life contributions.

**What's in Volume III**

Chapter 10. A Library for All Californians

Chapter 11. Arts and Culture

Chapter 12. Community Outreach and Volunteerism

Chapter 13. Athletics, Recreation and Summer Camps

Chapter 14. Conference Services and Housing Facilities

## 10. A Library for All Californians

The University of California has the largest educational library system in the world. In the Western Hemisphere, its holdings are second in size only to the U.S. Library of Congress. With more than 30 million bound journals and serials, UC libraries are a crucial source of information for industry, educational professionals and the community. The UC Library System is affiliated with the Association of Research Libraries and seven of its eight undergraduate campus library systems meet its rigorous criteria for membership. UC libraries are extremely comprehensive and diverse, including medical, law and business libraries of international distinction. In addition to the comprehensive size of the UC holdings and materials, other resources such as special collections and exhibits, outreach programs and educational resources have made the campuses' more than 100 libraries integral contributors to their local communities.

**Figure 10-1.**  
**Association of Research Libraries'**  
**North American Rankings of UC Libraries**

Berkeley	3
Los Angeles	11
Davis	38
San Diego	42
Irvine	61
Santa Barbara	75
Riverside	99

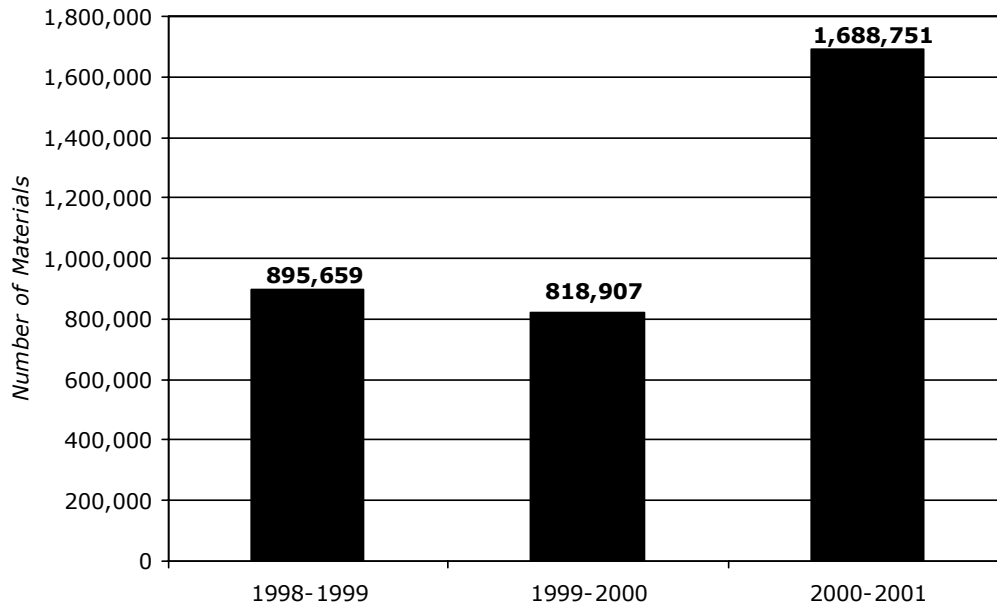
*ARL 2001 Rankings. San Francisco is a medical library and therefore is not ranked.*

### Open to the Public: Use of UC Library Materials

In addition to faculty and students, UC libraries serve thousands of community members who live and work beyond the campuses' borders. Use of UC library services by non-UC patrons includes circulation (borrowing) of materials. More than 3.4 million UC library items were borrowed by non-UC users from 1998 to 2001. In 2001, more than 15% of borrowing was by non-UC patrons. Moreover, library resources, including computers, databases, classes and outreach programs, have been made available to the public. Not quantified, but equally important, is the use of facilities and services by patrons who visit the library and use its resources

during business hours but do not borrow materials, and thus are not tracked systematically.

**Figure 10-2.  
Non-UC Circulation of Materials**



*Source: California Digital Library*

## Interlibrary Loan

Through interlibrary loan, the process by which one library requests material from or supplies material to another library, UC shares its resources systemwide as well as with other non-UC libraries around the world. The service is generally free to eligible borrowers. From a local public library, community members can access services and materials from any UC library.

The public (non-card holders) is also often able to get photocopies of books and materials directly from UC libraries for a small fee.

Libraries that participate in the interlibrary loan program include the libraries at UC campuses and the three UC-managed national laboratories (Berkeley, Livermore and Los Alamos), California State Universities, private universities and non-collegiate institutions, such as the Library of Congress and the Environmental Protection Agency.

## California Digital Library Services

The California Digital Library (CDL), often referred to as a “library without walls,” was one of the first collections of digital resources to enhance the physical collections at UC’s numerous libraries. Available to the public via the Internet, the

CDL provides invaluable digital access to special and archival collections of the university and its California partners.

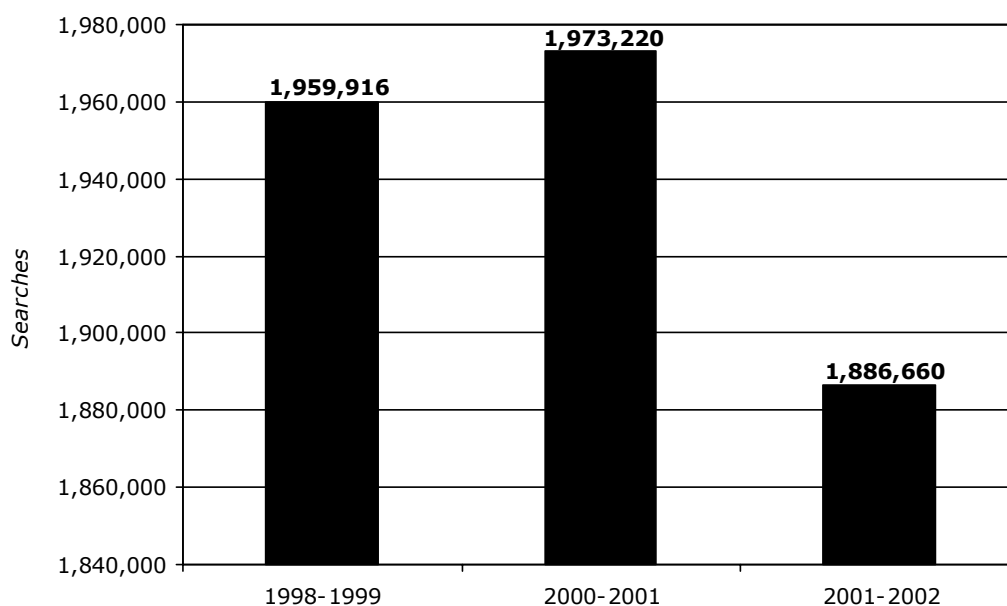
The CDL provides access to the following digital resources and is exploring methods to ensure perpetual access to them:

- UC Online Database Retrieval System (Melvyl)
- CDL Searchlight
- Collections and services.

### ***UC Online Database Retrieval System***

UC's online retrieval database, called Melvyl, produces a list of available resources and occasionally a full article depending on length. Melvyl's searchable database has more than 10 million titles representing over 15.7 million holdings. Available to the public via the Internet, Melvyl includes records of holdings and other materials such as maps, videos and sound recordings at UC libraries as well as the California State Library, California Academy of Sciences, California Historical Society, the Center for Research Libraries and the Graduate Theological Union.

**Figure 10-3.  
Non-UC Circulation of Materials**



*Source: California Digital Library*

### ***CDL Searchlight***

CDL Searchlight, an online search engine covering the physical and social sciences, engineering and the humanities, leads public users to books and materials from libraries around the world. Online users from a non-UC terminal cannot search UC

materials, but they are still able to search publicly available databases and other resources. However, anyone can enter a UC library and use CDL Searchlight to search both public and UC databases. Abstracts and full articles are often also available on the Web for printing or download. When only available in hardcopy form, users can request an interlibrary loan at their local library.

### ***Collections and Services***

***The Online Archive of California***, part of the California Digital Library, provides access to more than 6,000 collections of manuscripts, photographs and artwork in libraries, museums and archives across California. In only a three-month period (July-Sep. 2002), 52,131 non-UC users logged onto the OAC from their homes. In fact, more than 92% of searches of the OAC database were by non-UC users.

***UC's eScholarship Editions*** provide more than 300 UC Press books online free of charge to the public through an ongoing partnership between UC Press and the California Digital Library. By fall 2003, some 1,500 eScholarship Editions—about one-third of the UC Press books in print—will be available, with more than 400 available to the public. <http://escholarship.cdlib.org/ucpress/>

***Counting California***, another part of the California Digital Library, contains an online collection of more than 3,000 government and social sciences datasets about California's society, economy and lifestyle. Because of its scope, it is of particular interest to California residents, historians and educators. There were 41,626 non-UC user sessions (login from home) of the Counting California collection over the same three-month period. More than 95% of searches of this database are by non-UC users.

### **Campus Library Distinctions**

Many of the UC campuses are known for their unique libraries, collections and archives, which are generally available to the public. Some campus highlights include:

**Berkeley** The UC Berkeley library system, ranked 3rd nationally (and 1st among public universities) by the Association of Research Libraries, is considered among the finest research collections in the United States. With more than nine million volumes and a significant number of maps, manuscripts, photographs, video and sound recordings and electronic materials, UC Berkeley is the home to three main libraries, more than 20 subject-specific libraries and 12 affiliated libraries that carry special collections of unique, often difficult-to-find materials associated with research units, departments and professional schools on campus, including both law and business.

**Davis** In addition to its main and departmental libraries, UC Davis has health science, medical and law libraries. Shields Library (one of its main libraries) is home to the UC system's only viticulture and enology collection, materials on the cultivation and culture of grapes for making wine. It is ranked Level 5 (highest level), collection by Research Libraries Group ([www.rlg.org](http://www.rlg.org)).

**Irvine** UC Irvine's main library houses the South East Asian Archive, the "only archival collection in the U.S. with a sole focus on documenting the history of

immigrants from the former Indochina—Cambodia, Laos and Vietnam.” This is of particular local community interest because Orange County has the highest concentration of Vietnamese outside Vietnam (and more than 400,000 out of the 1.3–1.5 million Vietnamese living in the U.S.).

**Los Angeles** Ranked 11th overall by the Association of Research Libraries, UCLA’s libraries encompass more than 7.2 million volumes. It is home to the Pacific Southwest Regional Medical Library, one of eight collections of its kind, which coordinates information services for 12 resource libraries and more than 600 primary access libraries in Arizona, California, Nevada, Hawaii and U.S. territories in the Pacific (funded by the National Library of Medicine). UCLA also houses what is “arguably the largest and most comprehensive collection of materials related to the WWII internment and Japanese American history since the 19th century,” in the Japanese American Research Project archive at its Young Research Library.

**Riverside** UC Riverside’s Costo Collection of Native Americans is one of the largest collections of contemporary Native American materials in the world, with more than 80,000 documents, books, pamphlets, legal papers and photographs. Another collection of distinction is the J. Lloyd Eaton Collection of Science Fiction, Fantasy, Horror and Utopia, the largest cataloged collection in its field (with 65,000 volumes and 45,000 “fanzines,” science-fiction fan newsletters).

**Santa Barbara** UC Santa Barbara’s Map and Imagery Laboratory, the top “spatial digital collection” in the world according to the Association of Research Libraries, contains more than five million “information objects”—maps, aerial photography, satellite imagery and other spatial data. This data is available to non-UC visitors for a fee.

**San Diego** One of UC San Diego’s most well known schools is Scripps Institution of Oceanography. Complementing this prestigious graduate program is the SIO Library, one of the largest collections of data relating to the interdisciplinary study of oceanography. Special resources include the Aquatic Biology, Aquaculture and Fisheries Resources Database and the Marine, Oceanic and Freshwater Resources Database.

**San Francisco** One of the foremost health sciences universities in the world, UC San Francisco boasts an extensive, internationally renowned medical library. Housed at the Kalmanovitz Library are unique special collections, including a comprehensive “Legacy Tobacco Documents Library,” with more than five million documents related to the tobacco industry and its legal proceedings (part of a the 1999 Master Settlement Agreement; <http://caag.state.ca.us/tobacco/resources/msaumm.htm>). UCSF also conceived the AIDS History Project, which chronicles the evolution and development of San Francisco community-based organizations responding to the AIDS epidemic. The materials collected by the AIDS History Project are a significant resource to the local as well as the national and international community.

*For more information about UC's libraries:*

<http://www.universityofcalifornia.edu/cultural/libraries.html>





## 11. Arts and Culture

The University of California offers a variety of programs to enrich the cultural lives of its students and the surrounding community. Complementing its academic departments in fine arts, architecture, music, literature, languages and ethnic studies, UC is also home to several prominent museums, galleries and performing arts centers. Here local and internationally acclaimed artists can work and perform in an academic setting that is widely viewed not only by UC students and employees, but the public as well.

UC's many art facilities inspire and nurture an appreciation of the arts, music, literature and cultural offerings from around the world, including California's diverse communities. Campus Arts and Lecture programs also present authors, artists and experts at events that are open to the community.

This chapter highlights museums, arts centers, Arts and Lecture programs and institutes on UC campuses as well as special art and cultural events that UC often presents especially for the local community.

### Arts and Lecture Programs

**Berkeley** Cal Performances, UC Berkeley's arts and lecture program, brings music, dance and theater to the campus stage. Publicly available venues include Zellerbach Hall, (2,089 seats), Zellerbach Playhouse (547 seats) Hearst Greek Theater (outdoor 8,000+ seats) and Wheeler Auditorium (760 seats). The UC Berkeley venues were host to performances by the Berkeley Symphony Orchestra and the Merce Cunningham Dance Company in the 2001 season.

**Davis** UC Davis is home of the Mondavi Center for the Performing Arts, which opened in October 2002. The main venue for arts and lecture programs and the home of UC Davis music, theater and dance departments' performances, the Mondavi Center also hosts a variety of Arts and Lecture programs from the local area and internationally. With a combined seating of 2,050 (1,800 seat performance hall and 250 seat theater), it is the largest performing arts venue in the city of Davis, and rivals the size and space of the nearby Sacramento Community Center Theater, Convention Center and Memorial Auditorium. Notable inaugural-season events include performances by the San Francisco Symphony, the Sacramento Ballet, the Alexander String Quartet and internationally renowned cellist Yo-Yo Ma.

**Irvine** UC Irvine is the home of the 756-seat Barclay Theater. Although located on the UCI campus, Barclay Theater is privately owned and operated. Since opening in 1990, it has hosted more than 800,000 people at 1,600 events. Other UCI arts venues include Winifred Small Hall, the Little Theater and the Clair Trevor School of the Arts, the campus' main performing arts center. The Chancellor's Distinguished Fellows Series also brings noted scholars from around the world.

**Los Angeles** The Los Angeles campus is home to UCLA Live, an organization that puts on over 200 performances a year for more than 200,000 people. UCLA

performance venues include Pauley Pavilion (12,700 seats), the LA Tennis Center (6,800 seats), Royce Hall, Freud Playhouse and Schoenberg Hall. Performances have included the American Youth Symphony, Elvis Costello and the Big Dance Theater Shunkin.

**Riverside** UC Riverside Presents administers the cultural and art events on campus. UC Riverside's three main performing arts venues are the University Theater (480 seats) and Performance Lab on campus and an off-campus private theater, the Riverside Municipal Auditorium (2000+ seats). Past performances have included comedienne Margaret Cho, the Boys Choir of Harlem and the Shen Wei Dance Arts.

**Santa Barbara** UC Santa Barbara's Arts and Lectures Series has been entertaining the Santa Barbara community with performances, lectures and films for more than four decades. Performances have included lectures from actor Michael Douglas (a UCSB alum) and consumer advocate Ralph Nader and musical concerts by the Julliard String quartet and the Lincoln Center Jazz Orchestra directed by Winton Marsalis. Many of the performances are conducted in the 860-seat Campbell Hall, while smaller performances are often held at the 464-seat Lotte Lehman Concert Hall and 340-seat Hatlen Theater. Arts and Lectures also often present performances in downtown Santa Barbara at the 2,000-seat Arlington Theater and the 660-seat Lobero Theater. More than 17,000 campus visitors a year attend lectures and readings by such authors and leaders as Maya Angelou, Stephen Hawking or the Dalai Lama.

**Santa Cruz** UC Santa Cruz's Art and Lecture program is the largest performing arts organization in the Monterey Bay Region. UCSC has six performing art venues on campus and schedules presentations off campus at many privately and publicly owned venues in the surrounding area. Arts and Lectures also present two or three off-campus performances every year at the 2,300 seat Santa Cruz Civic Auditorium. In addition to its regularly scheduled programming, UC Santa Cruz Arts and Lectures offers programs to enhance understanding and appreciation of the art forms presented, including documentary films and collaborative multidisciplinary art exhibitions.

**San Diego** UC San Diego coordinates many on-campus performances at the Mandell Weiss Performing Arts Center. Many of the performances brought to UC San Diego use the 800-seat Mandeville Auditorium. The Mandell Weiss Performing Arts Center is home to the 500-seat Weiss Theater, the 400-seat Forum Theater and the 100-seat Forum Studio. It shares space with the La Jolla Playhouse—the largest performance venue in La Jolla.

## **Museums, Galleries and Institutes**

In addition to their Arts and Lecture programs, several UC campuses have their own museums, galleries, science centers and institutes that are valuable resources to working professionals, students and the community. The following campus highlights illustrate the breadth of these cultural offerings.

### Berkeley

**Berkeley Art Museum and Pacific Film Archive (BAM/PFA)** has approximately 60,000 visitors annually that view its holdings of experimental, rare and unusual archive of films and art. The BAM/PFA is a venue for several film festivals, including the San Francisco International Film Festival, the San Francisco International Asian American Film Festival and the 10th International Children's Film Festival. Thousands of community members visit each year. Renowned for both its art and films, the BAM/PFA presents groundbreaking exhibitions, outreach programs and experiences to students, artists, K-12 and the community. In addition to its gallery rooms, its 234-seat George Gund Theater provides a venue for watching films with the latest state-of-the-art projection and sound equipment.

**Lawrence Hall of Science** is a public science center that fosters mathematics and science education for school children. Lawrence Hall of Science is geared towards serving the local community and offers labs, camps, workshops and adult programs throughout the year. It also houses a planetarium, computer labs and rotating science exhibits.

**UC Berkeley Botanic Gardens**, in Strawberry Canyon, totals 34 acres and contains more than 13,200 different taxa. Renowned for its collection of rare and endangered species, it is the only natural history museum at UC Berkeley that is open to the public. Last year, 86 garden docents led 360 tours for 6,500 school children, 8,000 adults and 3,000 university students.

### Davis

**The Richard L. Nelson Gallery and Fine Arts Collection** includes more than 2,500 pieces of 18th, 19th and 20th century European, American and Middle Eastern Art. The gallery is open to the public, and class visits and tours are available. Recent exhibitions include "Images of Buddhism" featuring sculpture, painting, lacquer, textiles and ceramics from the Fine Arts Collection and private owners.

### Los Angeles

**The Geffen Playhouse** is a 498-seat house that was formerly a Masonic Affiliates Club located in LA's Westwood Village. One of the first 12 structures built in Westwood Village; its unique construction is reminiscent of Mediterranean and Spanish Colonial Revival architectural styles. More than 100,000 patrons enjoy up to five performances each year. In addition to providing high quality entertainment, featuring actors such as Christopher Lloyd in "The Unexpected Man" and the world famous mime Marcel Marceau, the Geffen Playhouse reaches more than 10,000 students and community members annually through its school-based and outreach events. Workshops, tours, educator programs and symposiums featuring experts in their field are open to the public.

**The UCLA Fowler Museum of Cultural History** is open to the public and has exhibits featuring art and materials from Africa, Asia, Oceania and the Americas.

With more than 750,000 objects, its African art collection is considered one of the finest in the world. The museum is also a community learning center, offering curriculum, workshops, tours and other outreach activities for families, students and teachers. The Fowler Courtyard is also available for public use and rental.

***The Ocean Discovery Center*** at the Santa Monica Pier is affiliated with the Marine Science Center. Open to the public, it provides classes and workshops for local K-12 students. More than 200,000 school children visit the center each year, participating in interactive lessons, hands-on demonstrations and habitat and marine life programs. The center's educational goals include teaching how the ocean affects the daily lives of students, families and the Southern California public.

## **Riverside**

***The UCR/California Museum of Photography*** is located off-campus in downtown Riverside. Catering to artists, scholars and the public, the museum is a venue for the Digital Studio, a program for young people and adults to get hands-on experience with cutting-edge digital media technologies. Workshops are available to students age 16 and up. Exhibitions have included photographs, films and short videos. It has received a \$500,000 National Endowment for the Arts grant to preserve their Keystone-Mast stereographic collection, the largest of its kind in the world.

***The Sweeney Art Gallery/Gluck Fellows Program***, on the UC Riverside campus, serves as a venue for the UCR art department, but is also a major resource to the entire Inland Southern California region. UC Riverside is one of only three universities that participates in the Gluck Fellows Program of the Arts (the others are Julliard and UCLA). At UCR, these fellowships are awarded to two art history graduate students. Along with Sweeney Gallery staff, these fellows present lectures and workshops at the art gallery for groups of K-12 students in the Riverside area. UCR's Gluck Fellows, along with other visiting artists, have provided almost 2,000 presentations and performances to an audience of almost 90,000 K-12 students and other community members in the Riverside area.

## **Santa Barbara**

***The University Art Museum*** has a permanent collection of more than 7,000 works, presenting art from a variety of periods, including contemporary art as well as temporary exhibitions. Among the collections is the Sedgwick Collection of Old Master Paintings, with works dating from the 15th-17th centuries. This is the only known collection of Renaissance Art in the Santa Barbara region. The University Art Museum also has an architecture and design collection in addition to its featured exhibitions.

## **Santa Cruz**

***The Seymour Marine Discover Center***, affiliated with the Institute of Marine Sciences and part of the Joseph M. Long Marine Laboratory, serves as a base for

field research in the Monterey Bay area and provides educational opportunities to the local community. The Long Marine Lab is the only working research laboratory in California that is open to the public. The Seymour Center gives the community a glimpse at the research, innovation and discovery that goes on within the Institute of Marine Sciences. Outreach and educational programs include curricula designed for schools, youth programs, teachers, visitors and members of the Seymour Center.

### San Diego

***The Birch Aquarium at Scripps***, the only aquarium of its kind in the greater San Diego area, welcomes more than 350,000 visitors each year. Providing educational resources, promoting conservation and research opportunities for the Scripps Institute, the aquarium is a dynamic and innovative “ocean museum,” featuring a Hall of Fishes (more than 60 tanks, the largest of which is 70,000 gallons), the Hall of Oceanography—arguably the largest display of oceanographic sciences in the U.S.—and an exterior plaza area geared towards public education.

***The Stuart Collection (public art)*** is one of the most unusual and distinctive site-specific sculptural artwork collections in the world. Composed of a variety of sculptures, many of the art pieces are integrated into existing campus buildings and facilities. Intended to “enrich the cultural, intellectual and scholarly life of the UC San Diego campus and of the San Diego community,” it is a fresh, original approach to on-campus art. Projects include Terry Allen’s “Trees”—three preserved eucalyptus trees encased in metal, individually known as the Music Tree, Literary Tree and Third Tree—installed between the Campus Library and Faculty Club. Bruce Nauman’s “Vices and Virtues” is the critically acclaimed installation of neon words that spell out the seven pairs of vices and virtues mounted on the Charles Lee Powell Structural Systems Laboratory.

### Special Art/Cultural Events and Programs

Several UC campuses have ongoing festivals, art parades and yearly events to complement the local spirit of the community and the historical traditions of the area. Often these events are co-sponsored with the local governments, or hosted/funded by individual departments. Below are some examples of these programs:

**Davis** UC Davis has an annual “Picnic Day” that showcases the campus’ diverse resources, including a parade complete with floats, contests, musicians, magicians, theater groups and a children’s area for crafts and storytelling. In 2002, more than 50,000 visitors attended 150 UCD community events.

**Irvine** The annual Arts Week Celebration at UC Irvine attracts a large community audience. This year, more than 1,000 people attended the week-long event, including a staging of “My Fair Lady”, movie classics, an evening with the UC Irvine Symphony Orchestra and a faculty artist exhibition of painting, sculpture, new media and photography.

**Los Angeles** “The Los Angeles Times Festival of Books in Association with UCLA” is a two-day event held each year on the UCLA campus. The event includes lectures, book reviews, workshops, storytelling and demonstrations for the public. A source of entertainment and education, the festival features more than 400 authors, including such illustrious writers as Ray Bradbury and Annie Proulx. In 2002, more than 140,000 book lovers attended the event, the largest in the United States.

**Santa Cruz** One of the top 10 Shakespeare festivals in the country (*USA Today*), “Shakespeare Santa Cruz” brings innovative and entertaining performances to the UC Santa Cruz campus and the local community. In addition to the unusual and engaging regular performances, Shakespeare Santa Cruz holds a variety of special events, including weekend programs of educational lectures and workshops, tours of venues, family days and “Shakespeare to Go,” where the entire company travels to various locations in a four-county area, performing for schools and community groups.

For more information about...

- *UC museums and archives:*  
<http://www.universityofcalifornia.edu/cultural/museums.html>
- *Visual and performing arts at UC:*  
<http://www.universityofcalifornia.edu/cultural/arts.html>
- *UC arts outreach programs:*  
<http://www.universityofcalifornia.edu/cultural/artsoutreach.html>
- *UC botanical gardens and herbaria:*  
<http://www.universityofcalifornia.edu/cultural/gardens.html>
- *UC aquariums and marine centers:*  
<http://www.universityofcalifornia.edu/cultural/marine.html>
- *UC observatories and planetariums:*  
<http://www.universityofcalifornia.edu/cultural/observatories.html>
- *UC newspapers and TV/radio stations:*  
<http://www.universityofcalifornia.edu/cultural/tvradio.html>

## 12. Community Outreach and Volunteerism

The University of California campuses support a variety of community, K-12 development and youth outreach programs within each of their neighboring regions. Some of these activities span several campuses, such as the acclaimed ArtsBridge program, while others are unique to an individual campus or region. UC staff, students and faculty also volunteer in numerous UC and non-UC programs whose goals reflect the local community's interests and needs.

More extensive information about these programs and their accomplishments are available online:

- *UC's Involvement with Communities (includes web links to campus programs)*  
<http://www.universityofcalifornia.edu/community/involvement.html>
- *Serving California's Communities (UC program list)*  
<http://www.ucop.edu/uer/state/maps.html>
- *UC Partnerships with California Schools*  
<http://www.universityofcalifornia.edu/collegeprep/k12partners.html>

The following highlight just a few of these programs:

### Educational Outreach Programs

**ArtsBridge** ArtsBridge, found at UC's eight undergraduate campuses and several other non-UC campuses, provides three major services: support of young scholars in the discipline of the arts, classes for K-12 and curriculum and training of local teachers. In 2001, UC ArtsBridge programs served nearly 24,000 students and 267 schools across California. Nearly two-thirds of these schools were identified as "under-performing" by the state Department of Education. For more about ArtsBridge and other UC arts-in-the-community programs:  
<http://www.universityofcalifornia.edu/cultural/artsoutreach.html>

**MESA** MESA (Math Engineering Science Achievement), a statewide math and science enrichment program geared towards disadvantaged students, has been named one of the country's five most innovative public programs and has received awards from the Ford Foundation, Harvard's John F. Kennedy School of Government and the Council for Excellence in Government. MESA programs can be found at UC's eight undergraduate campuses, as well as at more than 50 other California universities and colleges. In total, MESA serves more than 32,000 students annually. <http://mesa.ucop.edu>

**Irvine** Each of UC Irvine's 12 academic units conducts a faculty-directed education outreach program. Its campus wide Center for Educational Partnerships also sponsors more than 50 education programs that reach students, teachers and parents throughout the community. During the 2001-02 academic year, UC Irvine



outreach programs touched the lives of more than 33,000 K-12 students in California and engaged more than 2,300 teachers in professional development programs. These efforts encompassed virtually every discipline including the arts, reading, math and science.

**San Francisco** As UC's only exclusively health sciences campus, UC San Francisco provides unique educational opportunities to its local community. In addition to brown bag lectures scheduled throughout the year covering various contemporary topics, the campus offers Mini-Medical School, an evening lecture series encompassing many of the issues of the day in health science.

### Professional Development for Teachers

The largest professional development enterprise in California's educational system, UC teaches the teachers through California Subject Matter Projects and California Professional Development Institutes, which conducted intensive, standards-based institutes and other programs for more than 80,000 California teachers during 2000-01. For more on these programs, visit UC's web site at <http://tepd.ucop.edu/tepd/main/professional.html>.

### Volunteering in the Community

**Berkeley** UC Berkeley is home of the Cal Corps Public Service Center, which administers the campus' centralized student public service, leadership development, community development and civic engagement programs. Cal Corps brings together members of the UC Berkeley community in volunteer, outreach and educational opportunities. Programs include K-12 reading programs, food banks and several national (Americorps, America Reads) and community outreach programs (in areas such as recycling and civic awareness). In 2001-02, more than 2,500 UC students were involved in Cal Corps volunteer activities; more than 1,170 students were active in service groups; and 145 students were enrolled in Cal Corps' public service courses. These students dedicated an average of 10 hours per week to their various community service engagements.

**Davis** UC Davis students, faculty and staff (1,380 volunteers) devoted more than 240,000 hours to community service last year. This work included programs such as elementary school tutoring, the Peace Crop and local Park & Recreation cleanup days. UC Davis also annually puts on a "Week of Service," with participation from more than 700 students.

**Irvine** More than 4,500 UC Irvine students and staff volunteered their time, energy and expertise in the community during the 2001-02 academic year. Coordinated through the UC Irvine Volunteer Center, volunteers participated in 72 community programs, including beach clean up, services for the elderly, Earth Day events and homeless assistance programs.

**Los Angeles** UCLA has some 200 active community service programs. More than 7,000 students—nearly one-third of all UCLA undergraduates—are engaged in working with the community, volunteering their time and conducting field research.



## 12. Community Outreach and Volunteerism



**Riverside** UC Riverside students, faculty and staff spent more than 70,000 service hours in various community service activities with an educational emphasis—including tutoring programs, fundraising initiatives such as the School Supply drive (providing over 50 backpacks and supplies to area children) and mentoring programs such as Best Buddies in which more than a dozen UC students assist the mentally disabled from local special education programs.

**San Francisco** UC San Francisco provided services to more than 13,200 community members in 2001-02. Participants in the speakers' bureau, campus tours and special projects helped Bay Area residents become more familiar with the medical field.

For more information about UC's programs for K-12 students and educators:  
<http://www.universityofcalifornia.edu/educators/welcome.html>



## 13. Athletics, Recreation and Summer Camps

In addition to attracting thousands of California residents to its NCAA sporting events, the University of California campuses boast a variety of athletic and recreational outreach programs and amenities. Programs include but are not limited to year-round, on-campus recreational programs for youth and adult activities (such as camps and retreats), summer programs, adventure trips and the use of facilities by businesses. Generally an extension of campus recreational and physical education departments' services, these programs provide state-of-the-art athletic facilities such as Olympic-sized swimming pools, dance studios, climbing facilities and sporting fields that might not otherwise be available to the local community.

Recreational services and administration vary from campus to campus. Programs may be administered by UC or private entities; sometimes the facility space is rented out. Campuses often host annual or one-time events such as exhibitions and athletic meets.

The following are a few campus highlights:

**Berkeley** As part of its community outreach activities, UC Berkeley has a comprehensive sporting program aimed at youth, including adventure camps, recreation camps and specialized sports clinics. Areas of interest include dance, cheerleading, sport conditioning, team sports and more. These youth programs serve thousands of local area children.

**Irvine** The 5,000-seat Bren Events Center has served the UC Irvine campus and its neighbors for 15 years, as a popular venue for athletic and educational events. Open to the community, the center accommodated about 40 community activities in 2000-01, including religious fairs, sports camps, a dance competition and a corporate lecture series.

**Los Angeles** UCLA has won more NCAA team championships than any school in the nation—86 (66 men's and 20 women's) as well as another 21 collegiate titles. UCLA athletic events draw 574,000 fans each year to root for the Bruins. UCLA venues include Easton Stadium (softball), Drake Stadium (track and field) and the Rose Bowl (football), among others.

**Santa Barbara** Home to the "Michael Jordan Flight School," a summer camp open to elementary and high school students, UC Santa Barbara also hosts several cheerleading camps, dance programs on its campus during the summer months.

A comprehensive list of athletic and recreational programs is available on the UC system web site at <http://www.universityofcalifornia.edu/aboutuc/athletics.html>



## 14. Conference Services and Housing Facilities

One of the University of California's greatest assets is its self-sustaining campus facilities. On-campus dining commons, residence halls and conference services provide food, drink and housing for guests and residents. Stadiums, events centers, classrooms, lecture halls and conference rooms are used by UC students and employees, and are also available to the public often year-round and especially during the summer. When not reserved for university purposes, these facilities are frequently made available to the community. Often administered by UC conference services or facilities management departments, community programs (such as those described below) depend on UC facilities that offer comprehensive, modern and more affordable alternatives to private, commercial spaces.

Because administration of these inestimable resources varies from campus to campus, there is no single established statistical or methodological process of collecting data on their use. However, the following examples indicate the diverse uses of UC's conference services and residential housing facilities:

**Irvine** Besides providing venues for summer conferences with more than 2,700 participants annually, the UC Irvine Campus Student Center and selected other facilities are available for public use during the regular school year. Last year, the total number of visitors exceeded 11,500, with event participants from such organizations as Junior Statesmen of America, the Association of Environmental Professionals and the AIDS walk.

**Los Angeles** UCLA hosted more than 36,000 non-UCLA guests in their meeting facilities during the 2001-02 academic year. More than 75,000 guests also used on-campus housing for summer conferences.

**San Diego** Non-UC conference groups (summer only) at UC San Diego have included several types of outreach and community program groups from corporate, academic, social, association and leisure organizations. With nearly 1,900 participants using the facilities for educational reasons (science camp, teen conferences, etc.), more than 6,100 participants in sports programs (cheerleader camp, soccer clinic, etc.) and other outreach, social, religious and other category classifications, UC San Diego's conference facilities served a total of more than 11,600 participants in 2002.

**Santa Barbara** UC Santa Barbara's Conference Services also hosts a variety of non-UC programs that use the campus' conference space. More than 15,000 total participants visited UC Santa Barbara in 2001 for programs, including county leadership conferences, engineering and science programs and events by professional associations and social/religious organizations. Many of these programs directly benefit the community and improve the quality of life in the Santa Barbara area, including the Tri County Math Project Leadership Program aimed at K-12 and community college math teachers. Other programs use a number of UC facilities,

such as a Universal Cheer Association program with over 200 participants who dined and lived in UC residence halls, while using gym and recreational fields over a period of several weeks.

**Systemwide** According to a UCOP study of classroom use in 1999 that measured the percentage of classrooms scheduled for use for non-UC related classes during the summer, classrooms were in use up to 75% of the time, with activities including summer sessions, K-12 outreach, academic conferences, youth camps and more. A UC Office of the President study of summer 'bed usage' in 1999 ranged from percentages of approximately 10-75% utilization by non-UC users.