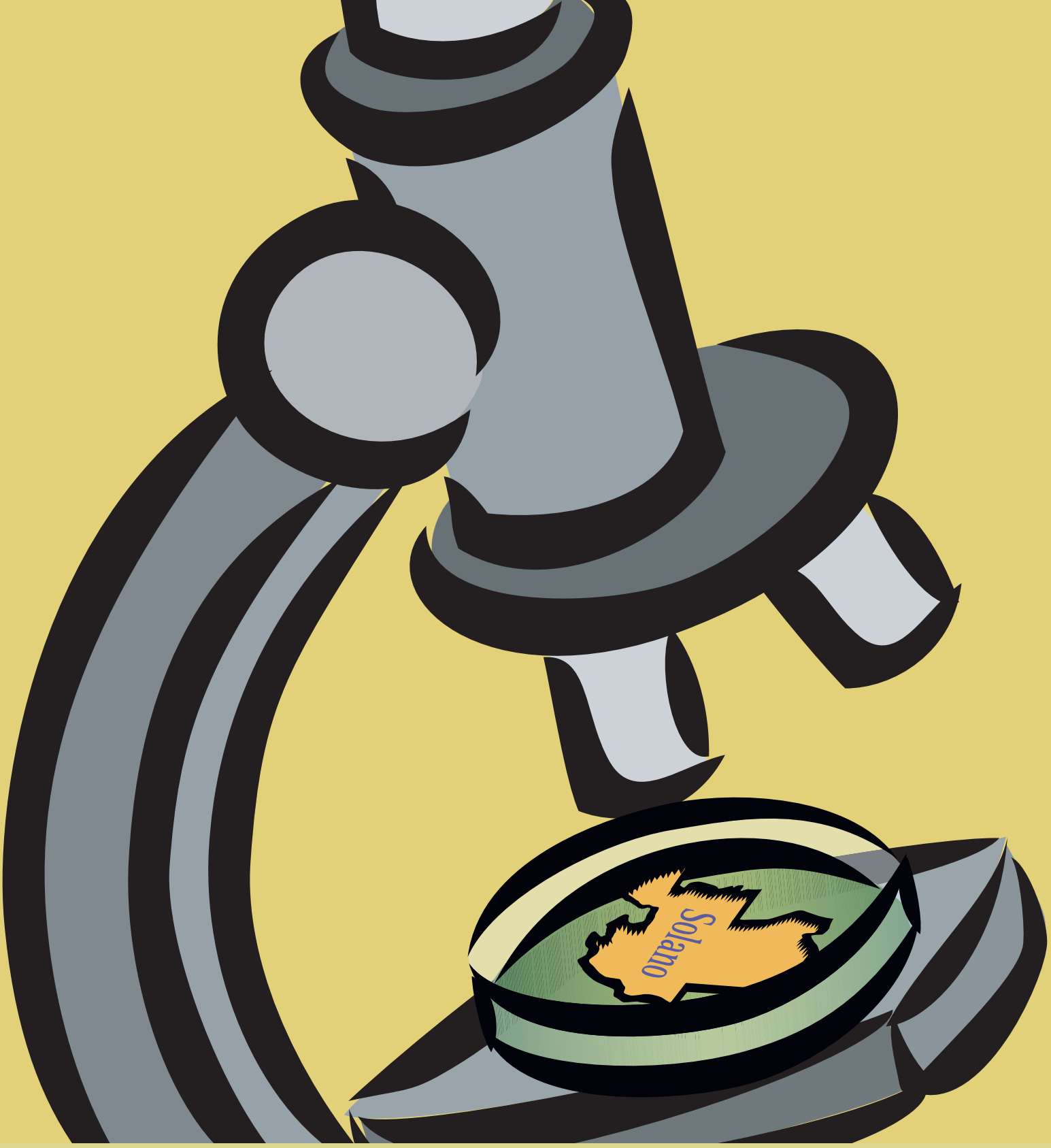


Solano County's Life Science Cluster

Solano Economic Development Corporation

Prepared by Collaborative Economics • February 2009

Table of Contents

On behalf of the Board of Supervisors and our community partners, I am pleased to present the first of several studies that are examining the industry clusters shaping the economy of Solano County.

This in-depth analysis of the life science industry cluster builds upon the annual *Solano County Index of Economic and Community Progress*, which debuted in November 2008. In that report, we learned that the growth of our life science cluster – pharmaceutical manufacturing, medical devices, biotechnology, research and development, and testing laboratories – was outpacing the Bay Area and the State. Today's analysis delves much deeper and unveils underlying principles behind the growth so we can use that knowledge to continue growing this cluster.

It is important to note that industry clusters do not happen accidently. Clusters happen when the right mix of people and resources exists that enable the industry to thrive and grow. We need to understand this synergy, and we need to foster a business climate that strengthens the cluster's growth in Solano County.

According to *BayBio's 2009 Impact Report*, California's life sciences industry created an annual average of 9,000 high paying jobs that were ultimately responsible for 1,200 approved treatments. Another 210 treatments are on track to be in the hands of patients in the next five to 10 years, which translates to a projected industry investment of $50 billion. We have to ask ourselves, are we poised to capture this potential? If not, are we committed to developing the economic development policies needed to attract a portion of this investment?

As community leaders, we need the information in this document to make those prudent decisions necessary to eliminate barriers and encourage the development of a skilled labor force that will continue moving the cluster forward. We hope this document will be used to further the discussion on the life science industries and strengthen our collaborative efforts to align education, public policy and infrastructure so they can sustain a thriving diverse economy and our shared long-term prosperity.

Sincerely,

John M. Vasquez
Chairman
Solano County Board of Supervisors

Executive Summary

The greater San Francisco Bay Area is a world leader in life science, and Solano County is well-positioned to play an expanding role in the continued development of the industry. Located along vital transportation arteries, the county is also located between two University of California research campuses, Davis and Berkeley, and is home to Touro University on Mare Island. Solano County's Life Sciences Cluster consists of firms within the following key industries: pharmaceuticals, medical devices, biotechnology, research and development, and testing laboratories.

Life Science is Growing in Solano County

Life science is growing in Solano County. In recent years, employment has grown robustly as well as employment concentration and average earnings in life sciences. Employment in Solano County's Life Sciences Cluster grew at an annual rate of 35% between 2000 and 2006. In contrast, life sciences in the rest of the San Francisco Bay Area reported annual average losses of 3% over the same period. Employment in life science and related industries is 60% more highly concentrated in the county than in the state as a whole.

Earnings are on the Rise

Average earnings are rising, which reveals the quality of jobs is also improving. Between 2006 and 2007 alone, average earnings in life sciences in Solano County increased 26% while average earnings in the county as a whole remained unchanged.

Jobs for Residents

Accounting for 78%, Solano County residents are filling the bulk of the county's jobs in life sciences. The percentage of Solano County residents employed in the Life Science Cluster increased 8% between 2000 and 2007, while the percentage of commuters decreased. Further, the educational attainment of county residents working in life sciences is increasing. While most employment is in manufacturing, the occupations associated with Solano County's Life Science Cluster span a broad range of skills and earnings levels. The county has a wide array of training options and is connecting high schools to training in life sciences.

Innovation and Awards

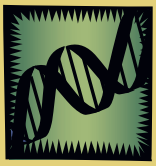
The region's research assets are contributing to technological innovation and thereby attracting federal research grants. The National Institutes of Health (NIH) funding of non-federal researchers in the county is on the rise. Over the seven-year from 1995 to 2001, six grants were awarded to organizations in Solano County, and in the more recent seven years, thirteen NIH Extramural Awards were granted.

How to Keep it Growing

The current economic climate is posing new challenges to the growth of Solano County's Life Sciences Cluster. The future outlook for the county's cluster will depend on numerous factors. Given the current economic climate, there are things Solano County can do to encourage the continued development of its Life Science Cluster:

- **Ensure the availability of appropriate R&D and manufacturing space**
- **Ensure infrastructure requirements are met particularly related to water supply and management**
- **Consider how local tax policies could support the continued growth of life science companies**
- **Develop relationships with local research universities and local industry to spur innovation and business start-ups in the county**
- **Further develop promising training opportunities in the county such as the biotech academy and others**

History of Life Science in Solano County



The San Francisco Bay Area is a global force in life sciences with four major research universities and a high concentration of life sciences companies. Technological breakthroughs achieved by San Francisco-based companies over thirty years ago established the region as the world's center for advanced medical technologies.

In 2005, the top three countries in biotechnology patents accounted for 64% of all patent registrations in biotechnology and were United States (40.6%), Japan (17%), and Germany (7%).[1] The broader San Francisco Bay Area ranked first in the number of patents registered in life sciences between 2003 and 2005. With 1,284 patents over this period, the San Francisco Bay Area was followed by Boston-Worcester-Manchester area (1,148), the New York-Newark-Bridgeport area (869), and the San Diego-Carlsbad-San Marcos area (720).

As this industry has developed over the years, it has distributed activities across the region. Opportunely located along key transportation corridors and between the Davis and Berkeley campuses of the University of California, Solano County has provided an attractive location for manufacturing plants. Since 2001, Mare Island has been the home of Touro University with coursework focusing on the health sciences. In addition to its location, Solano County and its cities provided life science companies incentives for land and permitting as well as workforce training. Biosource Technologies made the first move in 1985 relocating from Palo Alto. Later, Alza placed a large manufacturing plant in Vacaville in the late 1980s to take advantage of building incentives. During the nineties, other companies have followed, establishing large-scale R&D and manufacturing plants in the county. Other companies in the county include two in Benicia: Acrometrix is a laboratory and manufacturer of quality control materials for diagnostic testing, and Gammex is a manufacturer and distributor of Quality Assurance Products and Services for Diagnostic Imaging and Radiation Oncology. By 2007, there were 40 life science business establishments in Solano County ranging from small to large in employment size[2].

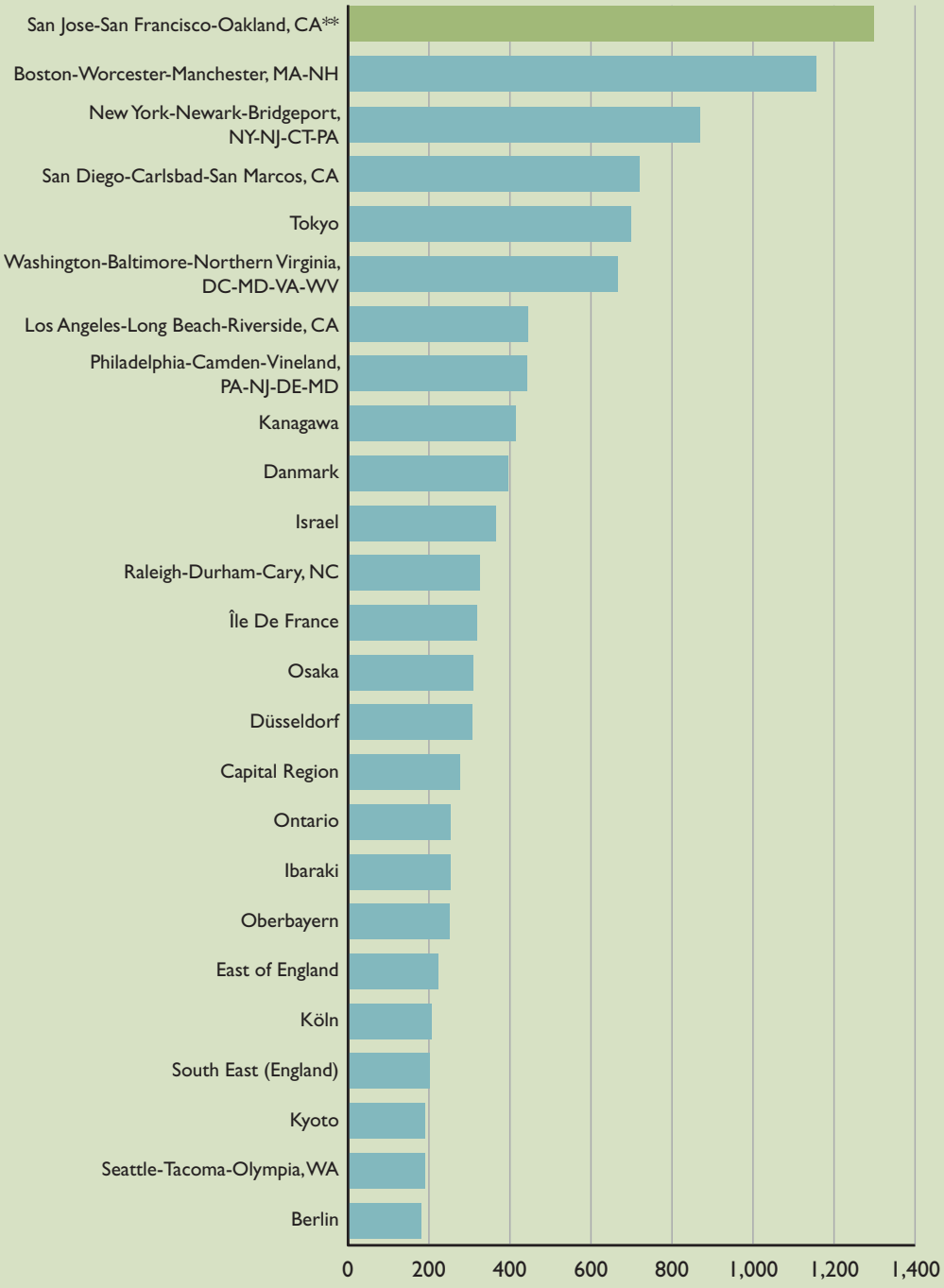
The Life Science Cluster in Solano County is comprised of public and private export-oriented industries, support sectors, and infrastructure. An industry cluster is a geographic concentration of independent, internationally competitive firms in related industries, and includes a significant number of companies that sell their products and services outside the region. Healthy, outward-oriented industry clusters are a critical prerequisite for a strong community. The core industries include biotechnology, pharmaceuticals, medical devices, and scientific research and development. These industries could not exist or grow without having supporting industries such as medical labs, medical supplies, diagnostics, and testing laboratories. The cluster infrastructure is equally important and consists of research universities, specialized clinics, and biomedical research centers, and workforce training.

[1] According to the Organization for Economic Co-operation and Development (OECD) the definition for biotechnology patents are patents for "the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods, and services." OECD Compendium of Patent Statistics, 2008, Page 18.

[2] Based on California Employment Development Department, Quarterly Census of Employment and Wages.

Top 25 Regions* in Biotechnology Patents

Number of Biotechnology Patents Applications filed under the Patent Co-Operation Treaty • 2003-2005



Data Source: OECD, Patent Database, June 2008; EPO Worldwide Statistical Patent Database, October 2007.
Note: Patent counts are based on the priority date, the inventor's country of residence and use fractional counts on PCT filings at international phase (EPO designations).

** The regional breakdown is presented at NUTS 2 level, except for Japan (NUTS 3), the United Kingdom (NUTS 1) and the United States (TL 3). In this breakdown, smaller countries such as Denmark and Israel are treated as regions.*

*** San Jose-San Francisco-Oakland, CA includes Solano County.*

World Leader

The San Francisco Bay Area is the world's top region in the registration of biotechnology patents.

Life Science Cluster Trends

Over the last decade, Solano County's Life Science Cluster has attracted more federal funding for research, increased employment and average earnings, and is developing training programs that link its high schools to its community colleges in order to help supply the growing demand for skilled workers.

Innovation

Innovation drives a region's economic success. The ability to generate new ideas, products and processes is an important source of regional competitive advantage. In life sciences, an important measure for innovation is grant funding awarded by the National Institutes of Health. The National Institutes of Health (NIH) funds non-Federal scientists and their institutions (known as the extramural scientific community) across the country and abroad to research leads in improvements in the prevention, detection, diagnosis, and treatment of various diseases and disabilities. The extramural scientific community receives 80% of the funds appropriated to NIH.[3] Funding in the county is on the rise. Between 1995 and 2001, six grants were awarded to organizations in Solano County. Between 2002 and 2008, thirteen NIH Extramural Awards were granted.

The NIH awards grants and contracts to universities, hospitals, small businesses, and other institutions for medical research. In the fiscal year 2002, three research institutions in Benicia, Dixon, and Fairfield received NIH awards totaling almost $1 million (2008 inflation-adjusted dollars). Receiving five awards totaling more than $1.2 million (2008 inflation-adjusted dollars), Touro University was the only organization in Solano County that received NIH Extramural Awards between 2006 and 2008.

The University of California at Davis has played a significant role in the growth of Life Sciences in Solano County. At the end of the 2007 fiscal year, there were 394 active U.S. patents in the U.C. Davis campus portfolio. This number represents an increase of 55% since 2000.[4] Receiving $532 million in the same fiscal year, U.C. Davis ranked twelfth in total research funding among U.S. public universities.[5]

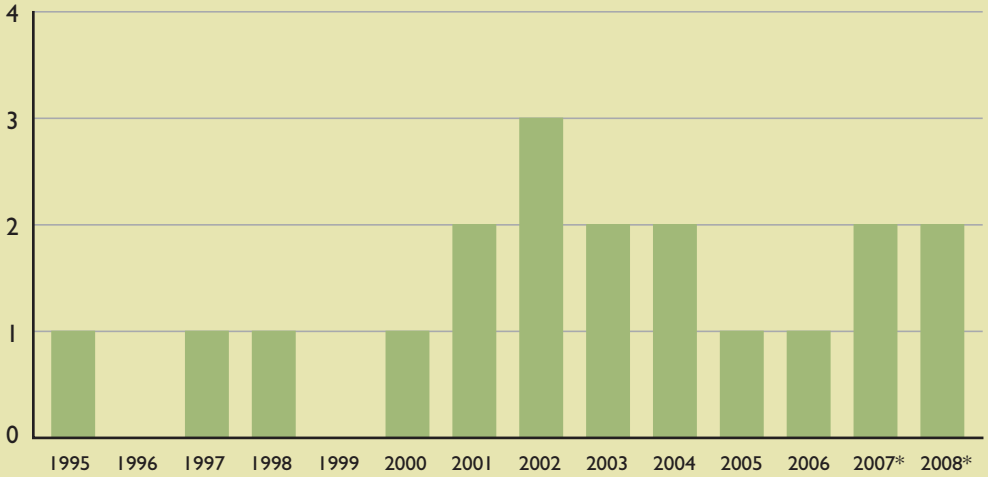
[3] National Institutes of Health, Fiscal Year 2009 Budget Overview. Page O-7. http://officeofbudget.od.nih.gov/UI/2008/Overview.pdf

[4] U.C. Davis, Innovation Access, http://www.innovationaccess.ucdavis.edu/home.cfm?id=OVC,23,1728,1735,1744

[5] U.C. Davis, Office of Graduate Studies. http://www.gradstudies.ucdavis.edu/prospective/whyucdavis.html

National Institutes of Health Research Grants Awarded in Solano County

1995-2008



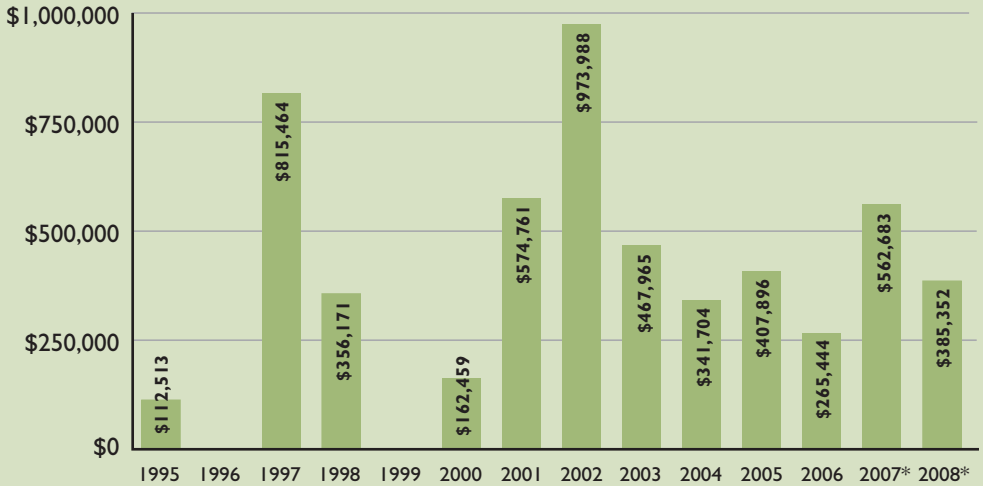
Data Source: U.S. Department of Health & Human Services, National Institutes of Health
Analysis: Collaborative Economics
* *Preliminary contracts data.*

Grants rising

Between 1995 and 2001, only six grants were awarded, but between 2002 and 2008, 13 grants were awarded to organizations in Solano County.

National Institutes of Health Research Grant Value

Total Amount Awarded in Solano County • 1995-2008



Data Source: U.S. Department of Health & Human Services, National Institutes of Health
Analysis: Collaborative Economics
* *Preliminary contracts data.*

Funding rising

Between 2002 and 2008, Solano County attracted $3.4 million in research funding from the NIH, a 68% increase in funding over the previous seven years.

Employment & Earnings

Solano County's Life Sciences Cluster consists of firms within the following key industries: pharmaceuticals, medical devices, biotechnology, research and development, and testing laboratories. In recent years, this cluster has grown robustly in terms of size, employment concentration, and earnings.

Employment in Solano County's Life Sciences Cluster grew at an annual rate of 35% between 2000 and 2006. Over this period, employment increased from 385 employees to 2,310. In contrast, life sciences in the rest of the San Francisco Bay Area reported annual average losses of 3% over the same period.

Employment in life science has become more highly concentrated in Solano County. Over six years, the county's employment concentration went from 60% below the State average to 60% above the State average. The employment concentration in the rest of the Bay Area is just 30% above the State average.

Real wage growth since 2000 has increased 30% in Solano County. In 2006, the annual average wage for Life Science Cluster employees was $78,300 (in 2008 inflation adjusted dollars). However, Solano's annual average wage was below that of the rest of the Bay Area ($112,900), California ($95,600), and the United States ($81,600) in life sciences.

Within the cluster, Pharmaceutical & Medicine Manufacturing posted the highest earnings of $82,000, while earnings in both Medical Equipment & Supplies Manufacturing and Scientific Research & Development Services averaged $52,000 a year.

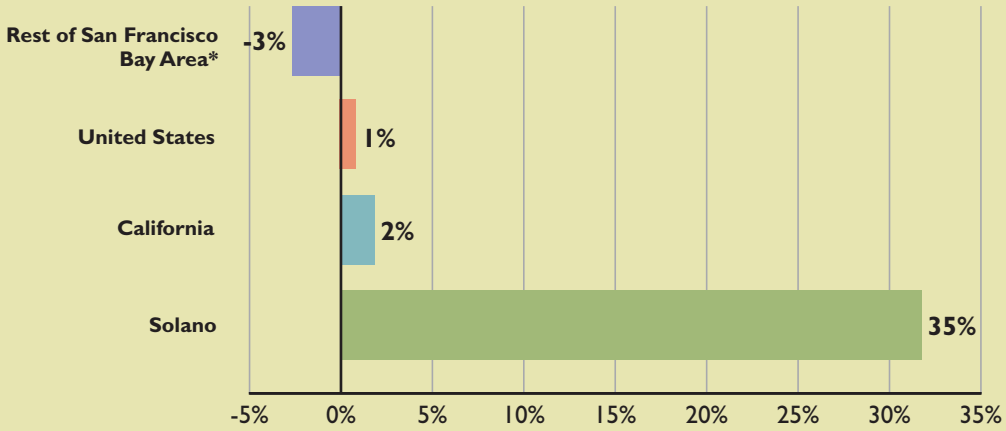
More recent data available for Solano County reveals a sharp increase of 26% in the Life Science Cluster annual earnings resulting in an average of $98,000 in 2007.[6] All of the industries within the cluster had annual average wages that either increased or remained the same between 2006 and 2007. Earnings growth was most significant in Scientific Research & Development Services (51%), Pharmaceutical & Medicine Manufacturing (33%), and Medical Equipment & Supplies Manufacturing (16%).

Also between 2006 and 2007, cluster employment increased by 10% while total County employment dropped 2%. The number of jobs in Solano County's Life Science Cluster increased from 2,310 to 2,530 in 2007. Medical Equipment and Supplies Manufacturing industry more than doubled to 237 jobs. Employment in Testing Laboratories grew by 19% adding 42 jobs.

[6] Due to changes in the North American Industry Classification System (NAICS) in 2007, a more recent cluster comparison to other regions cannot be performed.

Life Sciences Cluster Annual Average Growth Rate of Employment

Solano County, Rest of the San Francisco Bay Area, California, and the United States • 2000-2006



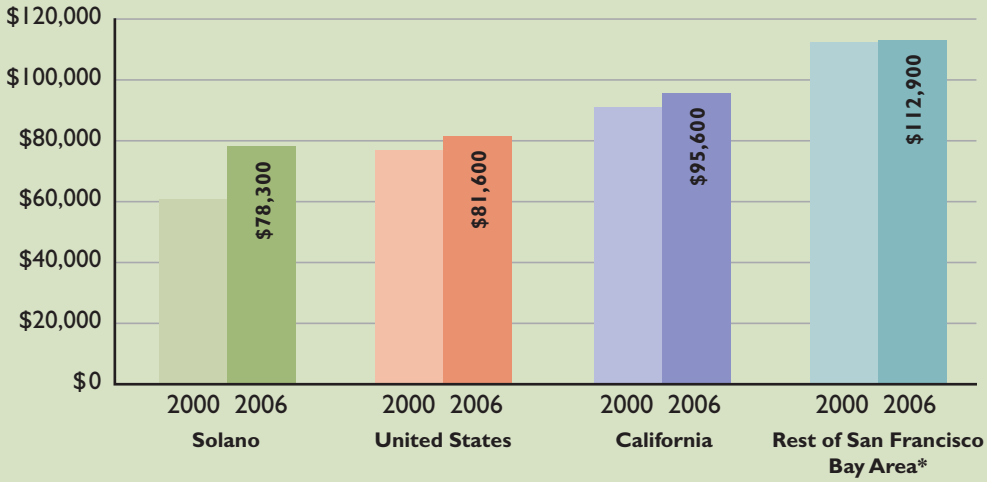
Data Source: California Employment Development Department, Quarterly Census of Employment and Wages
Analysis: Collaborative Economics
* *Rest of San Francisco Bay Area includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and Sonoma.*

What Does this Mean?

Employment in Solano County's Life Sciences Cluster grew at an annual rate of 35% between 2000 and 2006. Over this period, employment increased from 385 employees to 2,310.

Annual Average Wage in Life Science Cluster

Solano County, Rest of the San Francisco Bay Area, California, and the United States • 2000 and 2006



Data Source: California Employment Development Department, Quarterly Census of Employment and Wages
Analysis: Collaborative Economics
Note: Annual average wages are rounded to nearest 100s.
* *Rest of San Francisco Bay Area includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and Sonoma.*

Earnings are rising

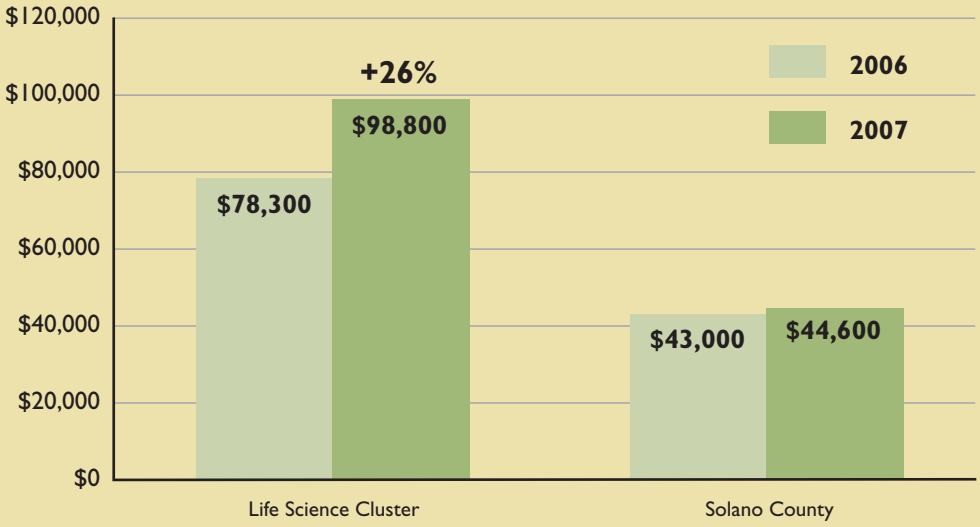
Between 2000 and 2006, earnings in Solano County's Life Sciences increased at a faster rate than in the state or nation.

+26%

Earnings in Solano County's Life Sciences rose 26% in a single year from 2006 to 2007.

Solano County Annual Average Wage

Life Science Cluster and Solano County Average • 2006 and 2007



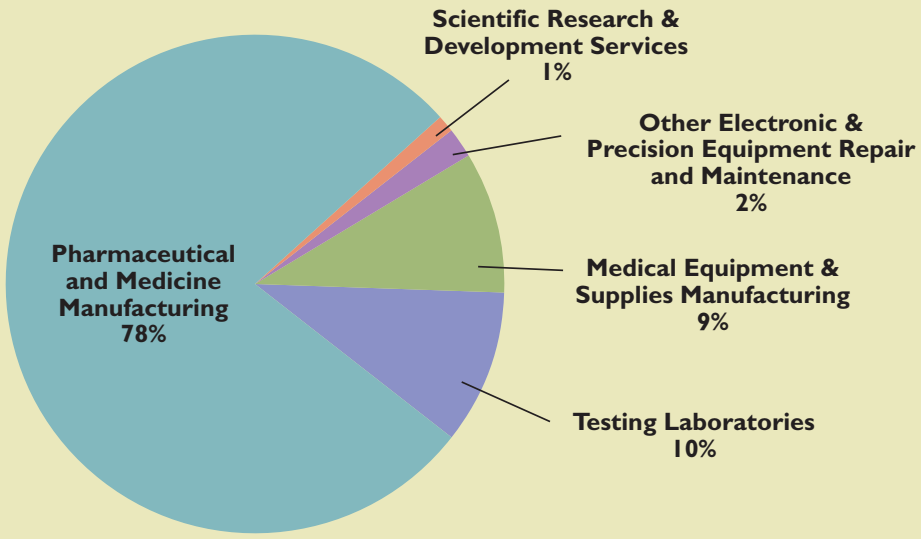
Data Source: California Employment Development Department, Quarterly Census of Employment and Wages
Analysis: Collaborative Economics

87%

Solano County jobs in Life Sciences are primarily in manufacturing.

Life Science Cluster Industries

Solano County • 2007



Data Source: California Employment Development Department, Quarterly Census of Employment and Wages
Analysis: Collaborative Economics

Workforce & Training

Solano residents are filling more of the positions in life sciences in the county, and the educational attainment of these workers is increasing. While most employment is in manufacturing, the occupations associated with Solano County's Life Science Cluster span a broad range of skills and earnings levels. The county has a wide array of training options and is connecting high schools to training in life sciences (see chart on page 13).

The number of Solano residents employed in the county's Life Science Cluster increased by 29% between 2000 and 2007 while commuters decreased 13%. In 2007, 78% of the Life Science Cluster jobs in Solano County were filled by county residents. Twenty-two percent of workers employed in life sciences in Solano County commute to work from outside the county. Eight percent of workers lived in Alameda County, 6% lived in San Joaquin County, and 5% lived in Contra Costa (see chart on page 14).

The number of workers in life sciences in Solano County has increased at both ends of the skills spectrum since 2000. By 2007, workers with a high school diploma represented 28% of the county's life science workforce after increasing 11% from 2000. Up from 10% in 2000, those with a graduate or professional degree represented 14% in 2007. Workers with either some college or a four-year degree decreased in representation over this period (see chart on page 14).

Examining this bi-polar growth by Solano residents and commuters, most of the growth in the highly educated workers is from Solano residents, while the vast majority of growth in workers with no more than a high school diploma is due to workers who commute into the county.

Eighty-seven percent of Solano County's Life Science Cluster employment is in manufacturing, and the associated occupations vary in skills and earnings levels. The range of occupations includes activities in research & development, production, and business services. Of the most common occupations, Natural Science Managers enjoy the highest earnings and require at least a four-year degree. Technicians typically require a two-year degree and earn an hourly rate of roughly $18.00 (see chart on page 15).

The life science industry requires skilled employees, thus a strong, local public education system provides the opportunity for a company to hire local employees that will help provide research, develop, and manufacture treatments.[7] BayBio, the region's life sciences business association, describes the urgency facing the future growth potential of this industry:

> *Fundamentally, no academic discipline is more important to the continued success of the industry than science education. Alarmingly, the U.S. Department of Education ranked California student achievement 48 out of 50 states in eighth grade science education in 2007. To maintain sufficient numbers of scientists with advanced degrees in the workforce, science and math must be a priority at all levels of education.*[8]

[7] For more detail, see: "California Cures: Translating Biotech Opportunity into California's Success." Bay Area Bioscience Association. 2008. Page 17.

[8] "BayBio: IMPACT 2009, Innovation Fuels the Golden State, Does California Have What it Takes?" BayBio. 2009. Page 10.

Recognizing this, Solano County has initiated different training efforts that aim to develop the region's workforce skills in the life sciences. These efforts include comprehensive programs at the local community college as well as out-reach programs in local high schools that offer students training at the community college. Other training resources at advanced levels include the University of California at Davis, California Maritime Academy in Vallejo, and Touro University on Mare Island. In addition, a regional consortium, BioTech System, was created in 2005 to help produce a workforce trained and educated in biotechnology for the life science industry in the Sacramento, Solano, and Yolo County region. The founding members of the consortium included representatives in biotech industry, community organizations, public high schools, colleges, universities, and local governments.

High School

Solano County has developed the Biotech Academy, a framework for helping high school students onto a career ladder in the life science industry. This effort helps youth find viable career paths and helps meet the growing demand for skilled workers in the life science industry. The high schools are in the third year of an articulation agreement with Solano Community College that allows high school students to earn up to a year of college credit toward an associate's degree or a certificate in biotechnology manufacturing. Currently, four high schools in the county are participating in the program: Angelo Rodriguez High School (Fairfield), Benicia High (Benicia), Hogan High (Vallejo), and Vacaville High (Vacaville).

However, challenges remain in the county's high schools where enrollment in math and science needs to improve. Other than a two-percent increase in the percentage of high school students enrolled in first-year chemistry, between the academic years 1993-94 and 2007-08, there has been little progress overall. In contrast to California as a whole, progress has been made in increasing enrollment in all math and science courses during the same period (see chart on page 16).

Solano Community College

Since 1997, the Biotechnology Program at Solano Community College has prepared students to join the workforce in the biotechnology industry in the Bay Area. Students in the program study the technologies used in the manufacturing of pharmaceutical protein products from various engineered cells. The program has almost doubled in size since its inception and attracts students with bachelor's degrees for additional training to work in a biopharmaceutical manufacturing plant. The biotech lab on campus houses over $1 million worth of equipment for training students as biotechnology technicians.

University of California at Davis

The University of California at Davis, ranked twelfth among public U.S. universities nationwide,[9] offers two biotechnology programs, U.C. Davis Biotechnology Program (started in 1986) and the University of California Systemwide Biotechnology Research and Education Program (UCBREP). The university offers undergraduate and graduate students the opportunity to study biotechnology and related fields. Undergraduates are trained in the necessary requirements for biotechnology-associated careers, and graduate program students are trained for potential advanced level careers.

[9] U.S. News and World Report. "2009 America's Best Graduate Schools."

In addition to the biotechnology programs, U.C. Davis provides services to connect research and industry through U.C. Davis InnovationAccess. Part of the Office of Research at U.C. Davis, the InnovationAccess unit has provided support and guidance in protecting intellectual property and entrepreneurship. Since 2000, the university helped foster 15 startups, nine of which are in the life science industry.[10]

Touro University

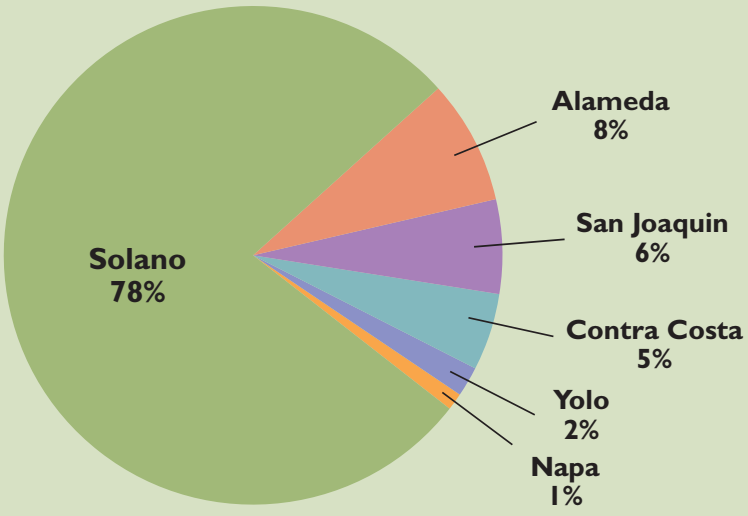
The College of Osteopathic Medicine at Touro University located on Mare Island performs comprehensive research in the health sciences: drug design, diabetes and lipid metabolism, cardiovascular biomarkers, electrophysiology, and osteopathic manipulative medicine. Over the last three years, the university has increased the size of the research facilities allowing for additional research. The National Institutes of Health, the American Diabetes' Association, and Pfizer support funding for the university's research.[11] The university has received approval to expand its cancer treatment and research center, which will include new treatment technology being developed at the Lawrence Livermore National Security Laboratory. According to the university, this center will house the world's first carbon treatment center with real-time imaging. In addition to the treatment center, there will also be facilities for hosting medical conferences for the purpose of broadening the use of this technology.

[10] U.C. Davis InnovationAccess, http://www.innovationaccess.ucdavis.edu/home.cfm?id=OVC,23

[11] Touro University, http://www.tu.edu/departments.php?id=58&page=833

Commute Flows of Life Science Employees

By County of Residence • 2007



Data Source: U.S. Census Bureau, 2007 American Community Survey PUMS
Analysis: Collaborative Economics

What Does this Mean?

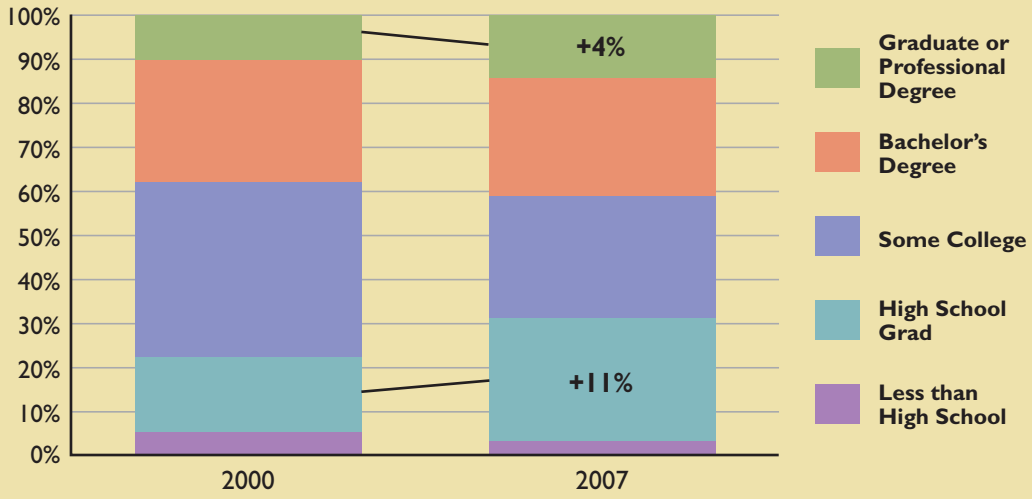
Solano residents provide the talent for 78% of the county's jobs in Life Science.

Skills demanded

Job growth between 2000 and 2007 has been at both ends of the skills spectrum but not in the middle.

Educational Attainment of Life Science Cluster Employees

Solano County • 2000 and 2007



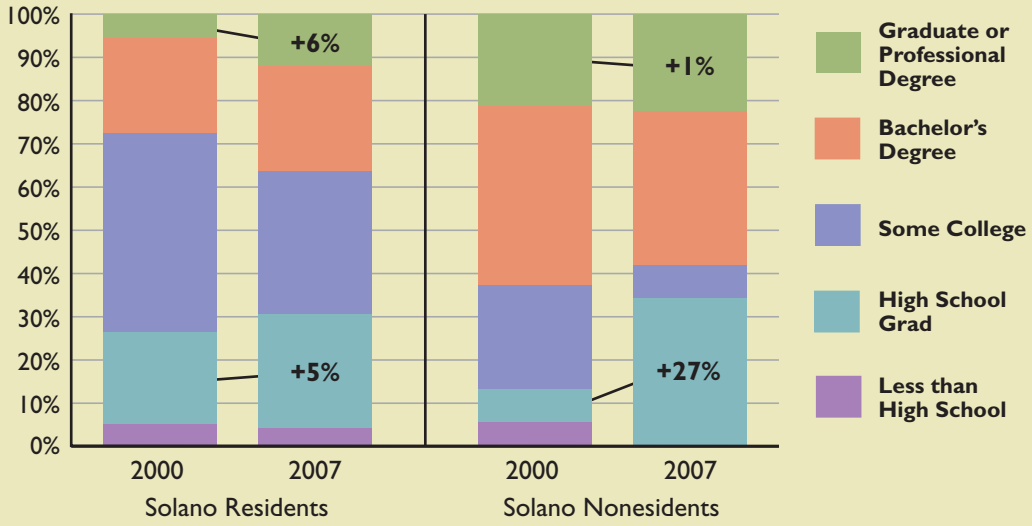
Data Source: U.S. Census Bureau, 2000 Decennial Census and 2007 American Community Survey PUMS
Analysis: Collaborative Economics

What Does this Mean?

Highly skilled talent working and residing in Solano increased 6% while high-skilled workers commuting from elsewhere increased only 1%.

Educational Attainment of Life Science Cluster Employees

Solano County Residents and Nonresidents • 2000 and 2007



Data Source: U.S. Census Bureau, 2000 Decennial Census and 2007 American Community Survey PUMS
Analysis: Collaborative Economics

Example Occupations in Solano County's Life Science Cluster

Occupation Title	Median Hourly Wage	Education & Training Levels
Industrial Machinery Mechanics	$31.76	Moderate-Term On-the-Job Training
Electrical and Electronics Repairers, Commercial and Industrial Equipment	$32.40	Post-Secondary Vocational Education
Mechanical Drafters	$23.19	Post-Secondary Vocational Education
Biological Technicians	$18.96	Associate Degree
Chemical Technicians	$18.31	Associate Degree
Medical and Clinical Laboratory Technicians	$18.65	Associate Degree
Radiologic Technologists and Technicians	$26.96	Associate Degree
Chemical Engineers	$41.19	Bachelor's Degree
Chemists	$25.79	Bachelor's Degree
Electrical Engineers	$43.62	Bachelor's Degree
Environmental Engineers	$41.73	Bachelor's Degree
Industrial Engineers	$34.97	Bachelor's Degree
Industrial Production Managers	$38.63	Bachelor's Degree
Mechanical Engineers	$44.98	Bachelor's Degree
Medical and Clinical Laboratory Technologists	$33.99	Bachelor's Degree
Engineering Managers	$53.59	Bachelor's Degree or Higher and Some Work Experience
Medical and Health Services Managers	$43.98	Bachelor's Degree or Higher and Some Work Experience
Natural Sciences Managers	$55.42	Bachelor's Degree or Higher and Some Work Experience
Medical Scientists, Except Epidemiologists	$25.27	Doctoral Degree
Microbiologists	$30.13	Doctoral Degree

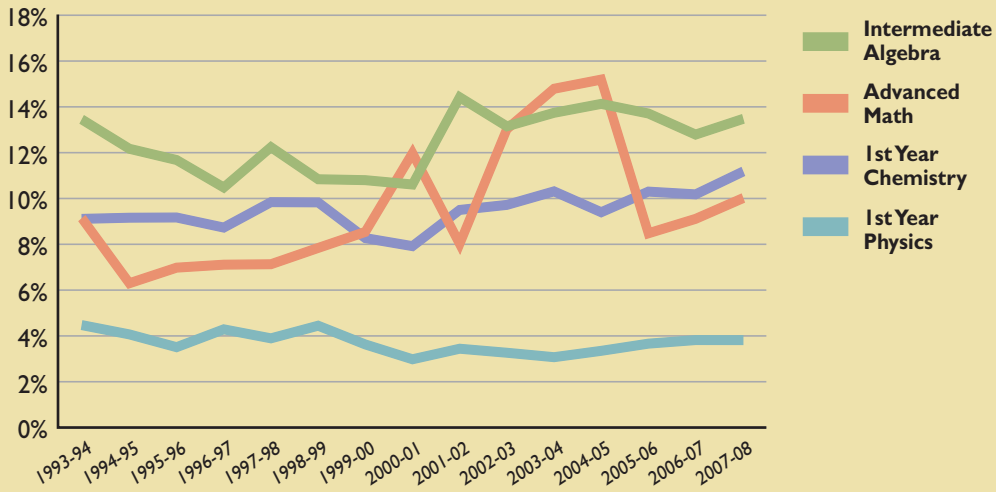
Data Source: California Employment Development Department,Occupational Employment Statistics
Analysis: Collaborative Economics

What Does this Mean?

No academic discipline is more important to the continued success of the Life Sciences industry than science education. Solano County has made little progress in math and science education.

Percentage of High School Students Enrolled in Upper Level Math and Science Courses

Solano County



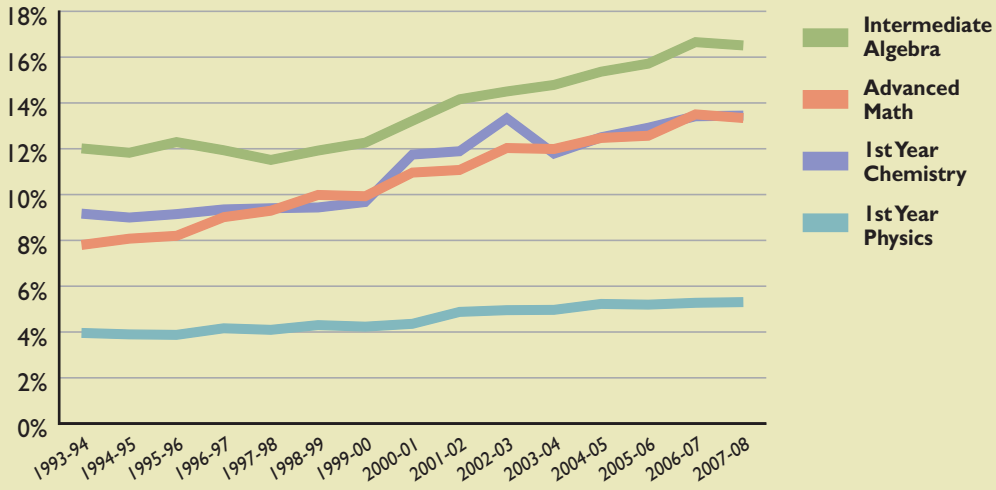
Data Source: California Department of Education
Analysis: Collaborative Economics

State progress

Statewide progress in math and science education has been stronger than in Solano County.

Percentage of High School Students Enrolled in Upper Level Math and Science Courses

California



Data Source: California Department of Education
Analysis: Collaborative Economics

Future Outlook

The current economic climate is posing new challenges to the growth of Solano County's Life Sciences Cluster. Traditional sources of revenue and investment are drying up, and emerging companies will need to rely on lower levels of venture capital funding and government research grants.

Venture capital (VC) investment is an important source of funding for the life science industry, and the San Francisco Bay Area is a hub for both biotech venture capital firms and biotech companies receiving funding. In 2007, 40 venture capital firms were located in the San Francisco Bay Area representing 30% of all biotech venture capital firms in the U.S. In addition, San Francisco Bay Area-based companies received 34% of all biotech venture capital investment in the U.S.[12] However, VC investment in biotech dropped 12% in 2008 from the previous year.[13] According to the California Biomedical Industry 2009 Report, from 2007 to 2008, statewide initial public offerings (IPO) stalled in biomedical and biotechnology companies, and mergers and acquisitions (M&A) continued at a slower rate primarily with companies with late-stage development products.[14] Slowing investment could slow the development of life sciences in the region as a whole.

The future outlook for Solano County's Life Science Cluster will depend on numerous factors. These include the availability of industrial and research space, infrastructure requirements, venture capital investment, and local tax policies. Given the current economic climate, what can Solano County do to encourage the continued development of its Life Science Cluster?

1 Ensure the Availability of Appropriate R&D and Manufacturing Space

The availability of industrial space is important for the Life Science Cluster to continue to grow in Solano County. Typically, small life science companies require workspaces between 2,000 to 10,000 square feet with access to wet labs; while, larger companies require significantly more square footage and infrastructure support.[15] Currently there is little wet lab space available in Solano County, and this could pose a barrier to the county's ability to grow and attract startups.

Commercial vacancy rates rose in the fourth quarter of 2008 reflecting the economic slowdown. The vacancy rate for R&D Flex increased from 10% to 16%, and vacancies in industrial space increased 1.5%. In addition, there was no new construction during the fourth quarter, leading to the possibility of more industrial square footage being absorbed. At the end of the year, total industrial inventory square feet was 23,154,517.[16] Currently, companies are planning expansions in the near future for manufacturing, maintenance, laboratories, office space, and warehousing.

[12] "Annual Review and Analysis of Real Estate Trends in the Life Science Industry." Elements 2007. Colliers International. Page 72.

[13] Source: PricewaterhouseCoopers/National Venture Capital Association MoneyTree™ Report, Data: Thomson Reuters

[14] "California Biomedical Industry 2009 Report." California Healthcare Institute. PriceWaterhouseCoopers. Page 23.

[15] "BayBio: Impact 2009, Innovation Fuels the Golden State, Does California Have What it Takes?" BayBio. 2009. Page 21.

[16] Data provided by Colliers International.

2 Ensure Infrastructure Requirements are met Particularly Related to Water Supply and Management

The accessibility of clean water is crucial for manufacturing in the life science industry, as well as proper hazardous materials disposal. The ability of Solano County and its cities to attract new bio-pharmaceutical manufacturing plants, as well as growth in existing companies, partially depends on the ability to guarantee an adequate quantity and quality of water supply. There is concern that some cities do not have sufficient water and sewer services for meeting any added demand of new biotechnology pharmaceutical manufacturing. This is an important factor for Solano County cities to consider when aiming to attract new manufacturing plants in the future.

3 Consider how Tax Policies Could Support the Continued Growth of Life Science Companies

Tax policies can play a significant role in supporting growth in the life sciences industry. According to BayBio, given the fact that emerging biotech companies typically need 15 years before a treatment goes to market, tax policies such as the recent extension of the Net Operating Loss (NOL) carry forward can help support start-ups and the industry's continued development. This policy now allows companies to deduct losses once they become profitable and reinvest more funds into ongoing research and development for 20 years instead of 10 years.[17]

4 Develop Relationships with Local Research Universities and Local Industry to Spur Innovation and Business Start-ups in the County

Research universities not only provide a region with quality jobs, they produce technological breakthroughs. Some of these advances have commercial potential that can be licensed to industry or spark a start-up business. By developing a closer relationship with the local research universities, Solano County could facilitate engagement between the research and business communities in order to encourage the innovation process and local business growth. Additionally, the plans of Touro University to host medical conferences for the purpose of spreading the adoption of its cutting-edge cancer treatment has potential for raising awareness of and strengthening Solano County's role in the greater San Francisco Bay Area's life science industry.

5 Further Develop Promising Training Opportunities in the County such as the Biotech Academy and Others

Ready access to a skilled workforce is essential to the success of life science companies. With its proximity to three research campuses, Touro University, U.C. Berkeley, and U.C. Davis, and further development of its local training programs, the county could build its regional advantage as an attractive location for life science companies. The Biotech Academy created by Solano County is a promising concept that sets high school students on the path for developing relevant skills needed by the local life science companies as well as developing viable career paths. The county would be well-served to invest additional effort in the success of this program and in the programs at the community college.

[17] "BayBio: Impact 2009, Innovation Fuels the Golden State, Does California Have What it Takes?". BayBio. 2009. Page 13

Existing Properties Industrial Market Statistics

Vacancy Rates in Solano County • 2008

Data Source: Colliers International
Analysis: Collaborative Economics
Note: Vacant square feet includes direct and sublease vacant square feet
** R&D Flex definition for Solano County was changed in Q4 2008.*

What Does this Mean?

The future outlook for Solano County's Life Science Cluster will depend in part on the availability of industrial and R&D space that meets the needs of Life Science companies.

Employment and Annual Average Wage of Life Science Employees

Data are provided by the California Employment Development Department's Quarterly Census of Employment and Wages (QCEW) survey. QCEW data is a comprehensive tabulation of employment and wage information for workers covered by State Unemployment Insurance (UI) laws and Federal workers covered by the Unemployment Compensation for Federal Employees (UCFE) program. Employment data excludes members of the armed forces, the self-employed, proprietors, domestic workers, unpaid family workers, and railroad workers covered by the railroad unemployment insurance system. Covered workers may live outside of the counties they work. Multiple jobholders (i.e. individuals who hold more than one job) may be counted more than once. The life science cluster is based on the North American Industry Classification system (NAICS) and the following NAICS codes: 3254, 3391, 541380, 5417, 811219. The rest of the San Francisco Bay Area includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and Sonoma Counties. Wages were adjusted for inflation and are reported in 2008 dollars using the U.S. city average Consumer Price Index (CPI) of all urban consumers, published by the Bureau of Labor Statistics.

Occupations in the Life Science Cluster

Data are provided by the Occupational Employment Statistics (OES) provided by the California Employment Development Department. The OES survey is a semiannual survey, measuring occupational wage rates and employment in nonfarm establishments. Median Hourly Wage is the estimated 50th percentile of the distribution of wages; 50 percent of workers in an occupation earn wages below, and 50 percent earn wages above the median wage. The wages from the first quarter of 2006 were inflation adjusted to 2008 dollars using the U.S. city average Consumer Price Index (CPI) of all urban consumers, published by the Bureau of Labor Statistics, and do not include self-employed nor unpaid family workers. The Bureau of Labor Statistics (BLS) developed occupational education and training levels.

Educational Attainment of Life Science Cluster Employees

Data are provided by the U.S. Census Bureau, 2000 Decennial Census and 2007 American Community Survey Public-Microdata Statistics for Solano County. The life science cluster is based on the North American Industry Classification system (NAICS) and the following NAICS codes: 3254, 3391, 5413, 5417, 8112.

Enrollment in Math and Science Courses

Data are from the California Department of Education DataQuest. The Enrollment in Selected Math and Sciences Courses by County was used, male and female enrollment data was aggregated for county totals.

Commute Flows

Data are provided by the U.S. Census Bureau, 2007 American Community Survey Public-Microdata Statistics for Solano County. The life science cluster is based on the North American Industry Classification system (NAICS) and the following NAICS codes: 3254, 3391, 5413, 5417, 8112.

Biotechnology Patents

Data are provided by the Organization of Economic Co-Operation and Development (OCED). Patent counts are based on the priority date, the inventor's country of residence and use fractional counts on Patent Co-Operation Treaty (PCT) filings at international phase (EPO designations). The regional breakdown is presented at NUTS 2 level, except for Japan (NUTS 3), the United Kingdom (NUTS 1) and the United States (TL 3). In this breakdown, smaller countries such as Denmark and Israel are treated as regions. Patents in biotechnology are currently identified using the following list of IPC codes: A01H1/00, A01H4/00, A61K38/00, A61K39/00, A61K48/00, C02F3/34, C07G(11/00, 13/00, 15/00), C07K(4/00, 14/00, 16/00, 17/00, 19/00), C12M, C12N, C12P, C12Q, C12S, G01N27/327, G01N33/(53*, 54*, 55*,57*, 68, 74, 76, 78, 88, 92)]. The region of San Jose-San Francisco-Oakland defined by the U.S. Bureau of Economic Analysis includes the following Metropolitan Statistical Areas (MSAs): Napa, CA; San Francisco-Oakland-Fremont, CA; San Jose-Sunnyvale-Santa Clara, CA; Santa Cruz-Watsonville, CA; Santa Rosa-Petaluma, CA; Vallejo-Fairfield, CA. The OECD's patent indicators are designed to reflect inventive activity, whereas patent data presented in the annual reports of patent offices are intended to reflect their own activity and are primarily for administrative purposes (e.g. budget planning).

National Institutes of Health Extramural Awards

Data are provided by the U.S. Department of Health & Human Services, National Institutes of Health. Award amounts were adjusted for inflation and are reported in 2008 dollars using the U.S. city average Consumer Price Index (CPI) of all urban consumers, published by the Bureau of Labor Statistics. The number of awards for Solano County is based on the city locations for the organizations awarded a grant. Preliminary data is used for fiscal years 2007 and 2008, contract data is not yet available.

Existing Properties Industrial Market Statistics

Data are provided by the Colliers International, Fairfield Office. Data is for 2008, and the following cities in Solano County: Benicia, Dixon, Fairfield, Suisun, Vacaville, and Vallejo (excluding Mare Island). Vacant square feet includes direct and sublease vacant square feet. Traditional R&D/flex is not present in Colliers International Fairfield Suburban market (by definition); therefore, brokers made the decision to change R&D/flex building types to Light Industrial in the fourth quarter of 2008.

Special thank to the following organizations that contributed data and expertise:

AcroMetrix

BayBio

California Department of Education

California Employment Development Department

Colliers International

U.C. Davis InnovationAccess

Gammex Inc.

Solano Community College

City of Dixon

City of Vacaville

Novartis

Organization for Economic Co-Operation and Development

Solano County Office of Education

Touro University

U.S. Department of Health & Human Services

U.S. Census Bureau

Solano EDC

The Mission of the Solano EDC is to attract, grow and retain business and industry in Solano County that enhance the economic vitality and quality of life in our communities. We serve as the facilitator of countywide and regional discussions on how to improve the way we work together and take action on critical employer, transportation, and education issues.

Collaborative Economics

Collaborative Economics is a nationally-recognized consulting firm specializing in developing regional indexes, working with private and public sector leaders to develop innovative solutions to pressing economic and community challenges, and advising civic entrepreneurs across the country and globally.

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