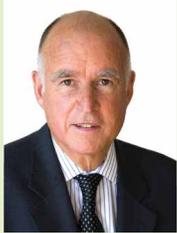




# California Life Sciences Industry Report 2019

## Letter from the Governor

California's thriving life sciences industry continues to grow thanks to the contributions of companies that have developed groundbreaking therapies to



**Jerry Brown**  
Governor of  
California

help treat many serious illnesses—including cancer, hepatitis and heart disease—and engineered more sustainable materials, smarter agriculture and cleaner chemicals.

Our innovative life sciences sector is a source of great pride for Californians and brings with it an impressive positive economic impact—more than 300,000 Californians are directly employed by life sciences companies, particularly in world-famous hubs in San Francisco, San Diego, Los Angeles and Orange County.

The state remains committed to helping ease the way for the industry's success as part of our global leadership in fostering a 21<sup>st</sup> century industrial revolution. This includes supporting a strong educational system to train the next generation of innovators, developing fair state tax and other policies and supporting sensible policies on the federal level.

As the trade association representing the industry, the California Life Sciences Association is a key asset in the state's efforts to cultivate a stronger life sciences community and boost job growth. With so many brilliant and dedicated people working to solve some of our most intractable problems, I believe the industry will continue to excel for years to come.

Sincerely,



## Letter to Stakeholders

In the 21<sup>st</sup> Century, biology is driving the most urgent innovations. In addition to generating new and better therapies for cancer, diabetes, neurodegenerative diseases and other conditions, biological scientists are working to maximize agricultural production, invent new biofuels and mitigate climate change.

The efforts will improve quality of life for people around the world with California's 3,400+ life sciences companies, world-class universities and biological research institutes leading the way.

In the process, the industry has become an economic powerhouse. In 2017, life sciences company revenues topped \$178 billion in California, and more than 311,000 Californians were directly employed throughout the sector. When indirect and induced employment is added—jobs that support and are supported by the sector—the total is 958,000 people employed by the industry in California.

These are tremendous contributions to California and the nation. But they pale in comparison to the medicines, devices and diagnostic tests the ecosystem brings to patients everywhere. California companies have more than 1,300 potential therapies in the pipeline that could help people facing cancer, infectious diseases, rare and genetic diseases and other conditions.

This 2019 California Life Sciences Industry Report outlines these and many other measures of success. Together, we have built something wonderful in California, something we must preserve and improve. While California's life sciences sector has done well, we face increasing competition. California Life Sciences Association (CLSA) is working with industry, academia and lawmakers to streamline regulations, increase education and research funding, improve the tax climate and deliver other policy changes that will protect health innovation and patient access to care.

We cannot forget the sound ideas that got us here. With your support, we can continue to grow California's life sciences innovation ecosystem and improve health outcomes for patients around the world.



**Sara Radcliffe**  
President & CEO  
California Life Sciences  
Association (CLSA)



**Peter Claude**  
Partner  
Pharmaceutical & Life  
Sciences Advisory PwC

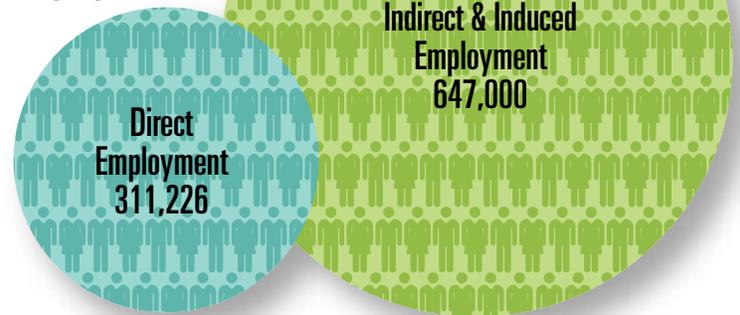
## A Growing Worldwide Footprint

As the overall economy has grown, California's life sciences community has more than kept pace. In 2018, there were 3,418 life sciences companies in the state—169 more than the previous year. Breaking it down further, more than 1,570 are pharmaceutical and biotechnology companies, up 117 from 2017. The other 1,848 companies produce medical devices, diagnostic tests, renewable energy, research tools and other products and services, 52 more than last year.

Exports increased from \$22.7 billion to \$25.2 billion, and the value of National Institutes of Health (NIH) grants awarded to California scientists went up to \$3.9 billion. Life sciences venture capital investment is estimated to increase from \$6.7 billion to \$7.6 billion.

The industry produced \$177.7 billion in revenue in 2017, compared to \$169 billion in 2016. The sector serves as an increasingly important element of the state's economy, with the life sciences community directly employing 311,226 people, an increase of more than 12,000 jobs from the previous year. More importantly, California's life sciences community helps people around the world, as innovators from the San Francisco Bay Area to San Diego tackle many unmet challenges in healthcare, energy production, agriculture and other areas.

**958,000** (approx)  
Total Direct, Indirect  
and Induced  
Employment



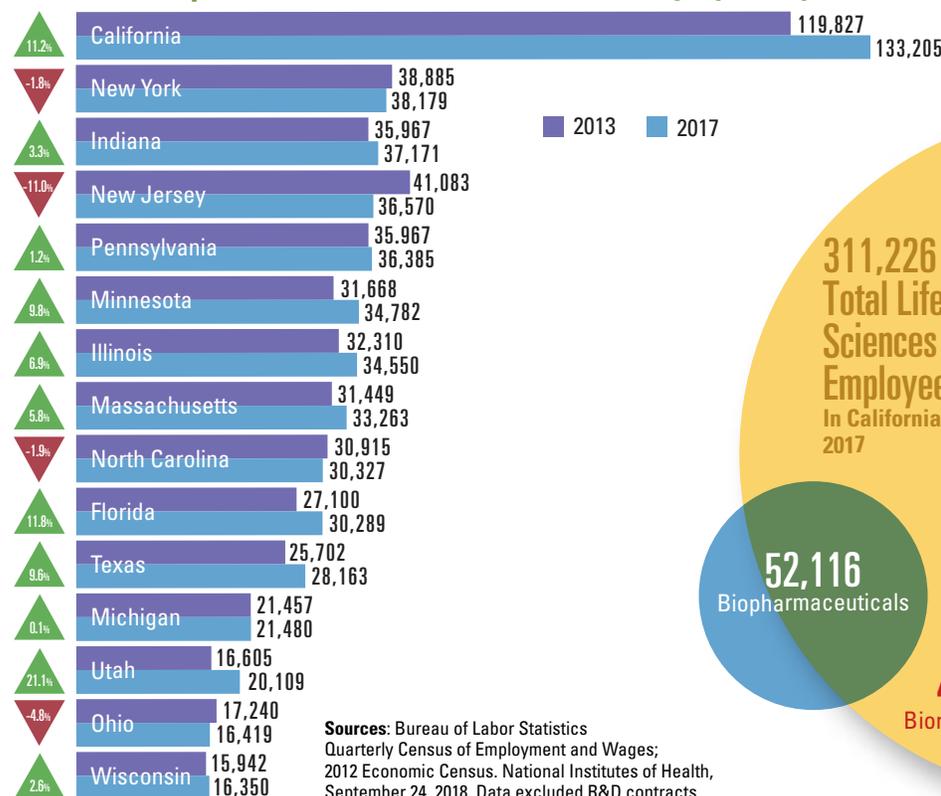
### California Life Sciences Industry 2017 (estimated)

Total Estimated Revenue .....	\$177.7B
Total Estimated Employment .....	311,226
Total Estimated Wages .....	\$37.1B
Average Annual Biomedical Industry Wage .....	\$119,070
Total NIH Grants Awarded, FY2018 .....	\$3.9 B
Total Estimated Venture Capital Investments, 2018 .....	\$7.6B
Total Biomedical Exports .....	\$25.2B
Direct Federal Taxes .....	\$12.5B
Direct State and Local Taxes .....	\$6.3B
Number of Life Sciences Companies .....	3,418

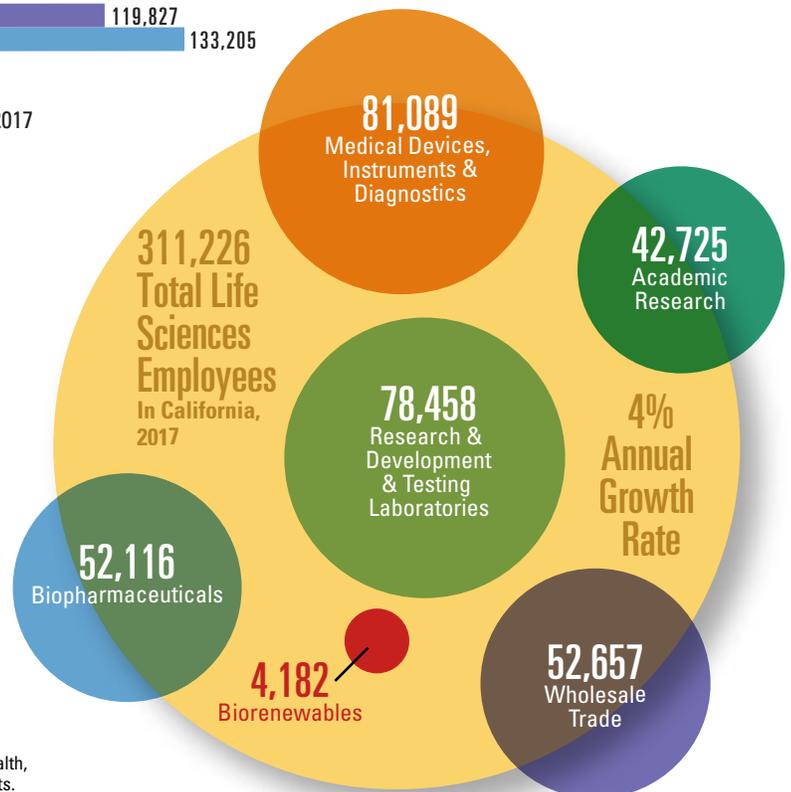
## Total Life Sciences Companies in California



## Growth in Biopharmaceutical & Medical Device Employees by State 2013-2017



Sources: Bureau of Labor Statistics Quarterly Census of Employment and Wages; 2012 Economic Census. National Institutes of Health, September 24, 2018. Data excluded R&D contracts.



## Life-Saving Therapeutics

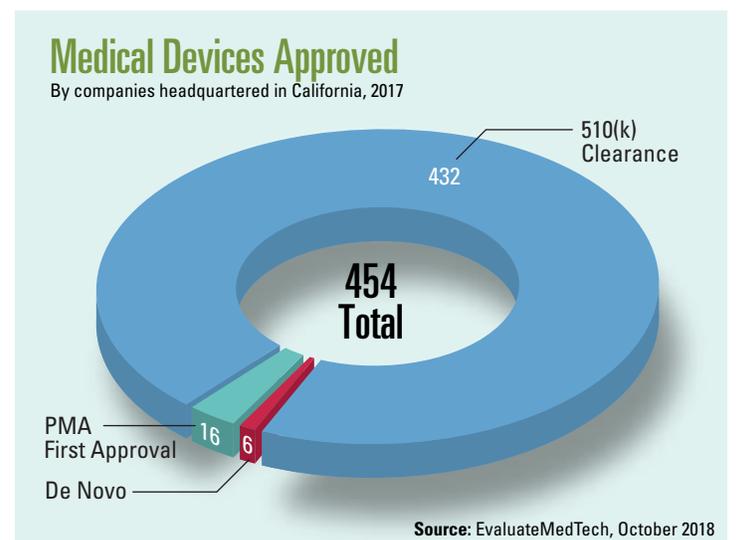
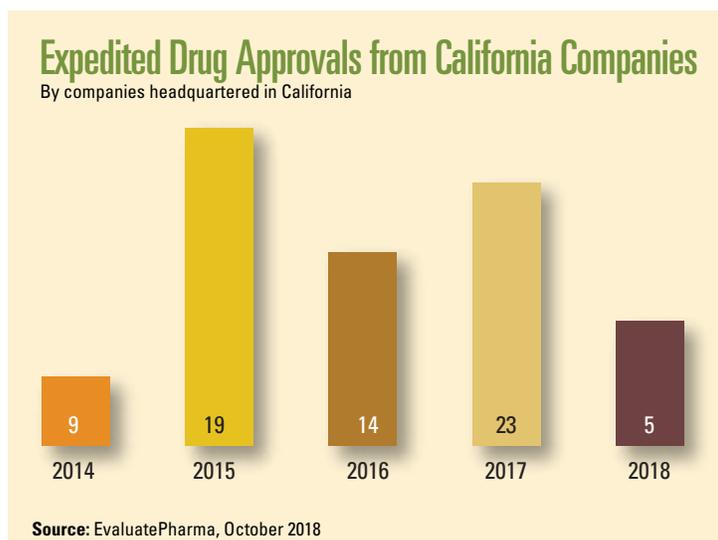
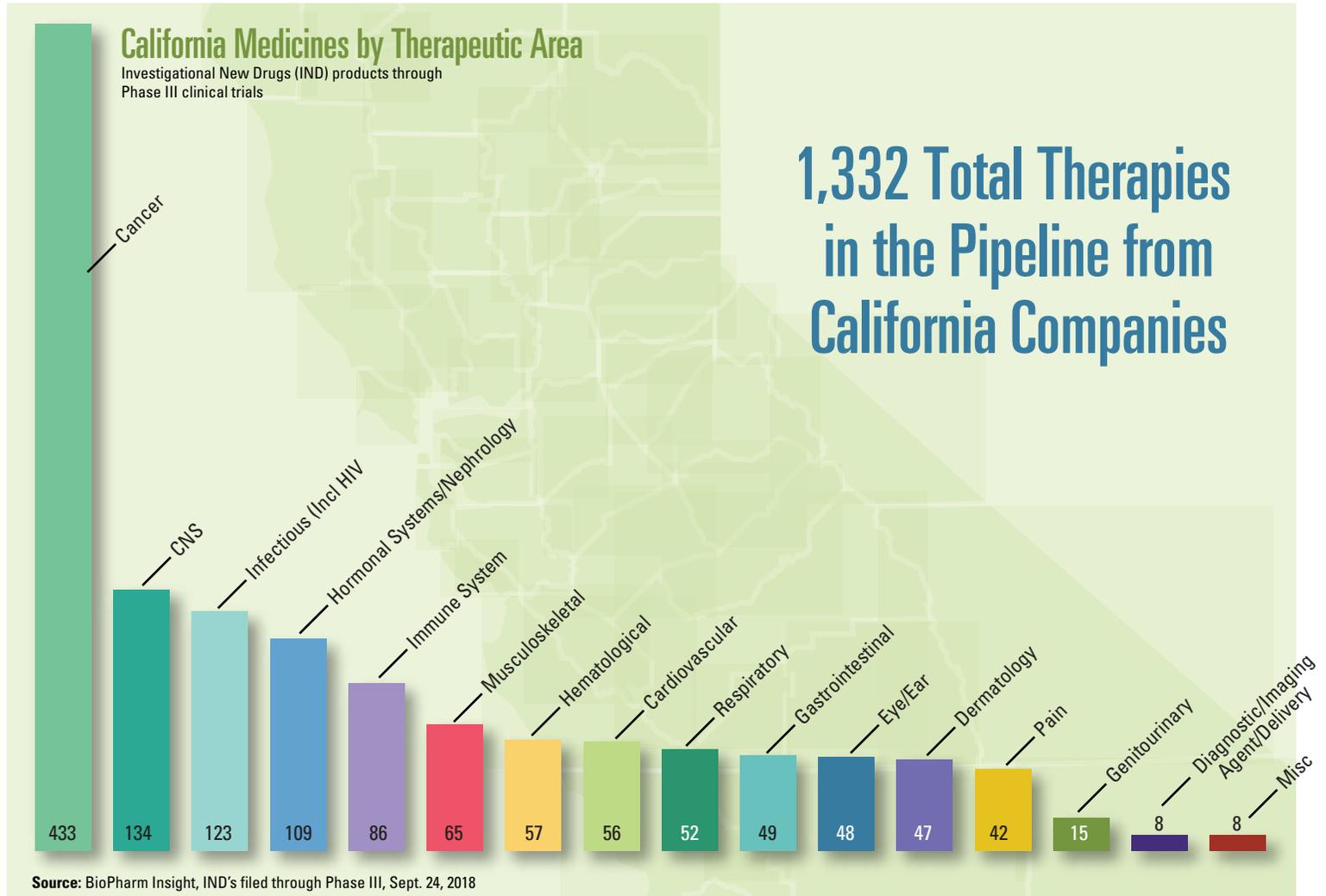
The ultimate return on investment is the new treatments and technologies developed. The therapeutic pipeline begins in academic and corporate labs and runs through U.S. Food and Drug Administration (FDA) approval and ultimately to new medicines for patients. In the middle, there is a long rigorous testing process to ensure therapies are both safe and effective, with only a small number successfully achieving this beneficial outcome for society.

In 2018, as of September 24, California companies have 1,332 medicines in that pipeline, compared to 1,274 at the same time in

2017. Of those, 433 are intended to treat cancer, 134 for central nervous system conditions and 123 for infectious diseases.

In addition, in 2017 and 2018, California companies received 28 expedited approvals from the FDA, accelerating the industry's ability to get new treatments to patients in critical need.

In medical devices, California companies received 454 product approvals in 2017. These included 16 PMA first approvals, six de novo approvals and 432 510(k) clearances.

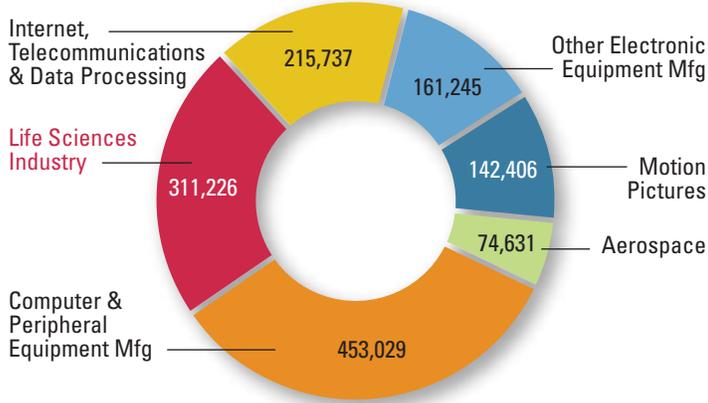


## Steady Economic Expansion

Next to new treatments, the most important thing the life sciences sector produces is economic growth. In 2017, life sciences companies directly employed 311,226 Californians, a 4.2 percent increase over the previous year. Indirect and induced employment brings that total to 958,000. The industry is second only to computer technologies among high-tech industries in California employment.

## Life Sciences Employment vs. Other Tech Sectors

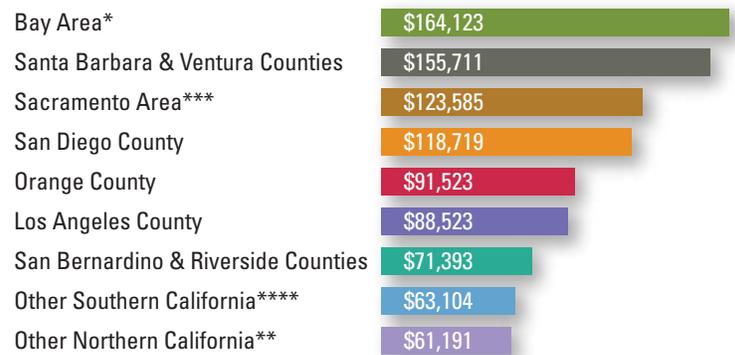
in California, 2017



Employment increased in all categories. The compound annual growth rate between 2013 and 2017 was 5.9 percent in biorenewables, 5.2 percent in research and development and 3.6 percent in biopharmaceuticals. The industry exported \$25.2 billion in goods and services, and companies and employees paid \$18.9 billion in federal, California state and local taxes. The average annual life sciences wage was \$119,000, increasing from \$114,000 the previous year.

## Average Annual Life Sciences Wages by Cluster

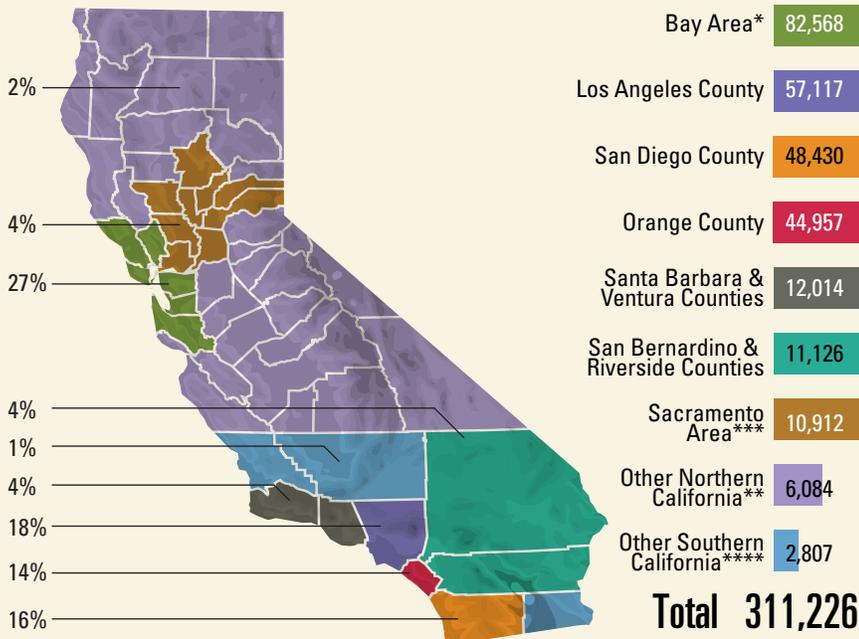
in California, 2017



**Source:** Bureau of Labor Statistics Quarterly Census of Employment and Wages; 2012 Economic Census.

## Total Life Sciences Employment by Cluster

in California, 2017



\* Includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara and Sonoma Counties.

\*\* Includes Monterey, Kings, Tulare, Inyo, San Benito, Fresno, Mono, Santa Cruz, Merced, Madera, Stanislaus, Mariposa, Tuolumne, San Joaquin, Calaveras, Alpine, Amador, Mendocino, Lake, Colusa, Sierra, Glenn, Plumas, Humboldt, Trinity, Tehama, Lassen, Shasta, Del Norte, Siskiyou and Modoc Counties.

\*\*\* Includes Sacramento, Butte, El Dorado, Nevada, Placer, Solano, Sutter, Yolo and Yuba Counties.

\*\*\*\* Includes Imperial, Kern and San Luis Obispo Counties.

**Note:** Clusters do not sum to total due to data suppression at the county level.

**Source:** Bureau of Labor Statistics Quarterly Census of Employment and Wages; 2012 Economic Census.

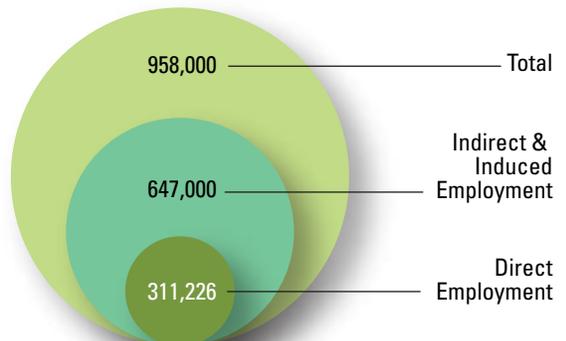
## Life Sciences Average Wages by Sector

in California, 2017



**Source:** Bureau of Labor Statistics Quarterly Census of Employment and Wages; 2012 Economic Census.

## Total Direct, Indirect and Induced Jobs



## Attracting Venture Capital Investment

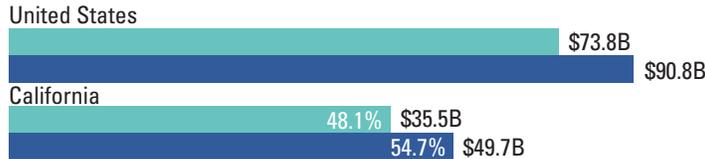
Because California companies have such a strong record of translating science into products that help patients, farmers, consumers and many others, the state has long been a magnet for investment. In 2018, California biotechnology and medical device companies are projected to receive \$7.6 billion\* in venture capital (VC) funding—compared to \$6.1 billion in 2017—leading the nation once again. Massachusetts was the next highest state, with \$6.2 billion.

The state also attracted \$3.9 billion in VC investment for digital health, again leading the nation. The next closest state was New York, with \$998 million. This was a major increase over the 2017 total for California, \$2.2 billion.

In addition, California saw 130 mergers and acquisitions in 2018 (through Sept. 19) and 13 initial public offerings for which terms were announced.

\*2018 data based on projection from the first two quarters

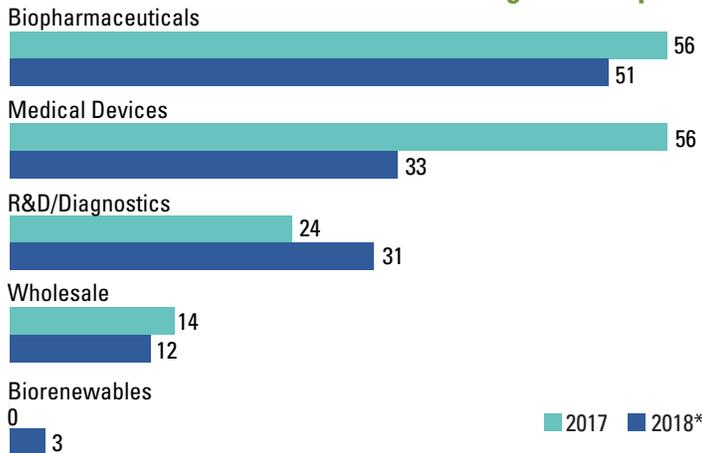
## Total US Venture Capital Investment in California



\*2018 data based on projection from the first two quarters

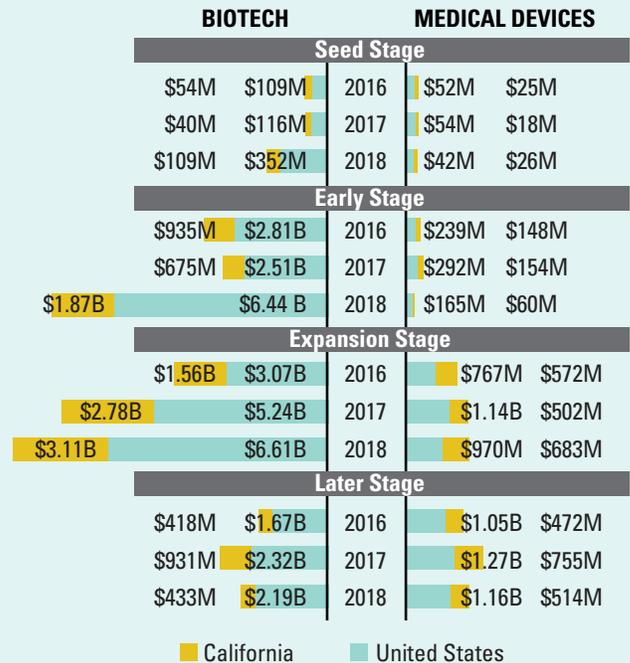
Source: PwC/CB Insights MoneyTree™ Report

## Number of California Life Sciences Mergers & Acquisitions

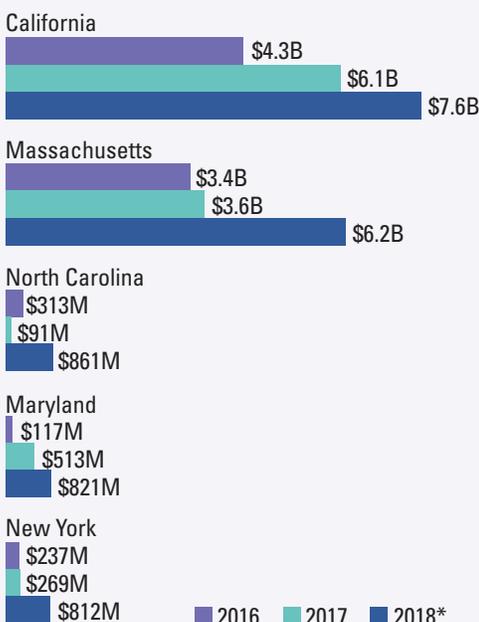


## VC Investment, Biotech & Medical Devices

by stage, U.S. and California 2016–2018\*



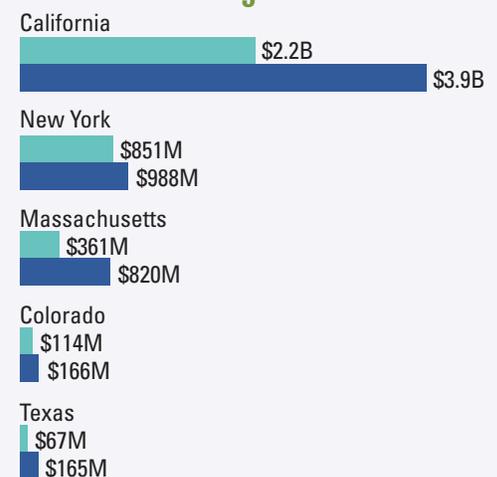
## Top 5 States for Life Sciences VC Investments



## California Digital Health VC Investment by Region



## Top 5 States for Digital Health VC Funding



\*2018 data based on projection from the first two quarters. \*\* Includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and Sonoma Counties. \*\*\* Includes Sacramento, Butte, El Dorado, Nevada, Placer, Solano, Sutter, Yolo, Yuba Monterey, Kings, Tulare, Inyo, San Benito, Fresno, Mono, Santa Cruz, Merced, Madera, Stanislaus, Mariposa, Tuolumne, San Joaquin, Calaveras, Alpine, Amador, Mendocino, Lake, Colusa, Sierra, Glenn, Plumas, Humboldt, Trinity, Tehama, Lassen, Shasta, Del Norte, Siskiyou, Modoc counties.

Source: Rock Health Digital Health Funding Database.

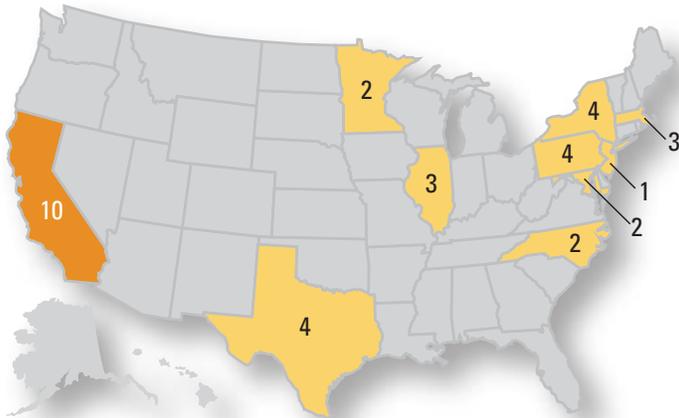
## Academic Support & Science Funding

California's excellent university system is one of the key drivers of the state's life sciences success. In 2018, the state had 10 universities in the Shanghai Index 100 top universities. The next closest is New York with four. In 2016, California graduated more than 4,900 science and engineering PhDs, by far leading the nation.

California research institutions received \$3.9 billion in research grants from the National Institutes of Health (NIH), 15.1 percent of all NIH

## Number of Universities in the World Top 100

Shanghai Index, 2018 Rankings

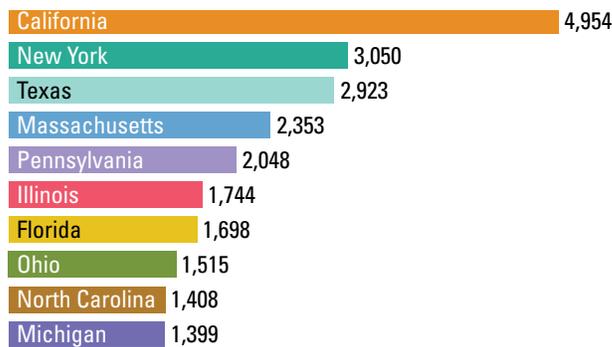


<b>California</b>	<b>10*</b>		
New York	4	Illinois	3
Pennsylvania	4	Massachusetts	3
Texas	4	Maryland	2
		Minnesota	2
		North Carolina	2
		New Jersey	1

\*Stanford University, UC Berkeley, California Institute of Technology, UCLA, UC San Diego, UC San Francisco, UC Santa Barbara, USC, UC Irvine and UC Davis.

Source: Academic Ranking of World Universities (ARWU) 2018, Shanghai Ranking Consultancy.

## Top 10 States with Doctoral Recipients in Sciences & Engineering



Source: NSF/NIH/USED/USDA/NEH/NASA, Survey of Earned Doctorates, 2016.

## Top 10 California Congressional Districts Receiving NIH Funding



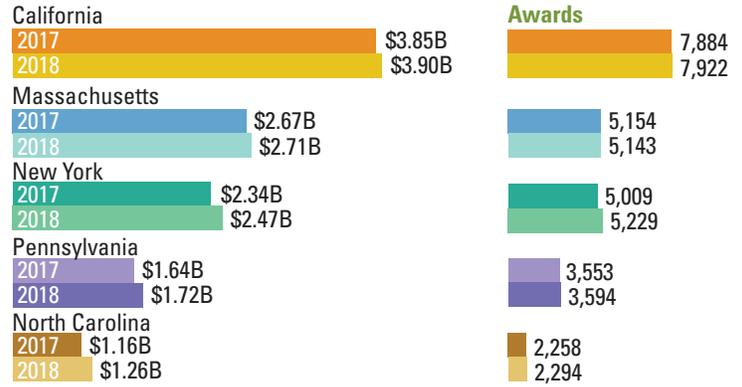
District 12	\$680M (1,399 Awards)
District 52	\$540M (1,114 Awards)
District 18	\$529M (1,113 Awards)
District 33	\$464M (913 Awards)
District 49	\$313M (475 Awards)
District 34	\$250M (445 Awards)
District 13	\$234M (522 Awards)
District 3	\$231M (479 Awards)
District 45	\$147M (315 Awards)
District 28	\$88M (186 Awards)

Source: National Institutes of Health.  
Note: Data excludes R&D Contracts.  
\*Updated through September 24, 2018

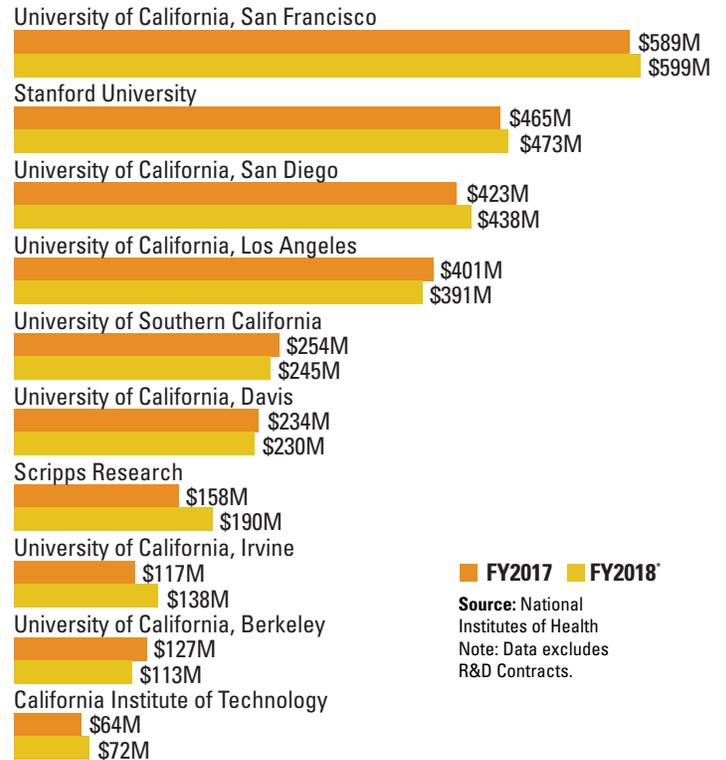
biomedical research grants. Start-up and emerging companies in the state also received almost \$195 million in Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) funding.

In addition, California research institutes and companies received \$170.8 million in grants from the California Institute for Regenerative Medicine (CIRM) to advance stem cell research.

## Top Five States Receiving NIH Grants



## Top 10 California Organizations Receiving NIH Funding



Legend: ■ FY2017 ■ FY2018

Source: National Institutes of Health  
Note: Data excludes R&D Contracts.

## Burgeoning Orange County



**Don Bobo**

When people talk about research hubs in California, they generally mention the Bay Area and San Diego. But don't discount Orange County—the region is showing rapid growth and much of it is focused on the life sciences.

“Orange County has become the economic engine of Southern California,” said Don Bobo, Corporate Vice President of Strategy & Corporate Development at Irvine-based Edwards Lifesciences and recent past chair of California Life Sciences Association (CLSA). “Today, more than 900 technology companies operate in Irvine alone, with more than half of those specializing in the life sciences and medical technology.”

With more than 4,000 Orange County employees, Edwards is a major anchor company for the medical device industry, along with Allergan, Medtronic and Abbott. As happens so often, these companies have attracted small startups to the area, providing a supportive ecosystem and a pool of talented industry professionals. Orange County also benefits from enormous academic resources in and near the county, including UC Irvine, USC, UC San Diego and many others.

“When you take a look at the university ecosystem in Southern California, it is incredibly productive,” said Bill Carpou, CEO at life sciences and technology business accelerator OCTANE. “These schools graduate more

engineers and computer scientists than anywhere else in the country.”

The results have been impressive. Orange County life sciences companies employed nearly 45,000 people in 2017, an 11 percent increase from the previous year. Of these, more than 23,000 were employed by device, instrument or diagnostic companies—the most in the state.

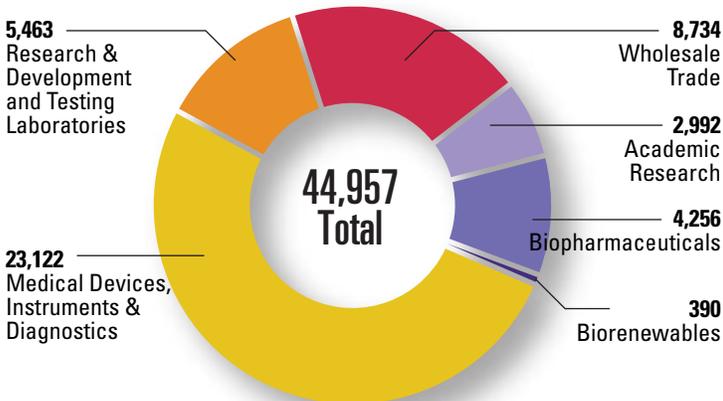
The region has also attracted tremendous investment. In 2016, LA and Orange County drew \$269 million. The 2018 projections put the total at \$348 million.

“Around 24 percent of the capital came from either New York or Boston,” said Carpou. “There’s a national recognition that we have great innovation in the life sciences community in Orange County. It’s a value play for investors.”

Orange County’s supportive environment for small and emerging companies boasts many success stories. Sonnendo is perfecting dental technology. Tagnos is taking on clinical logistics. Spinal Singularity seeks to improve spinal injury care.

“Our local innovators are dreaming big,” said Bobo, “and coming up with life-saving and life-enhancing technologies that will impact patient care all around the world.”

## Orange County Life Sciences Breakdown



Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages; 2012.

## Digital Health VC Investment in Orange County

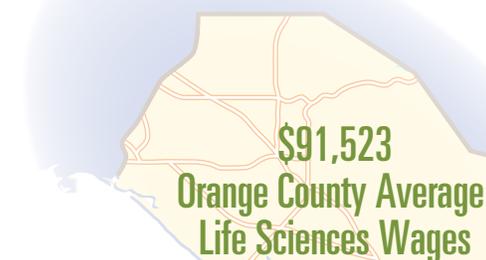
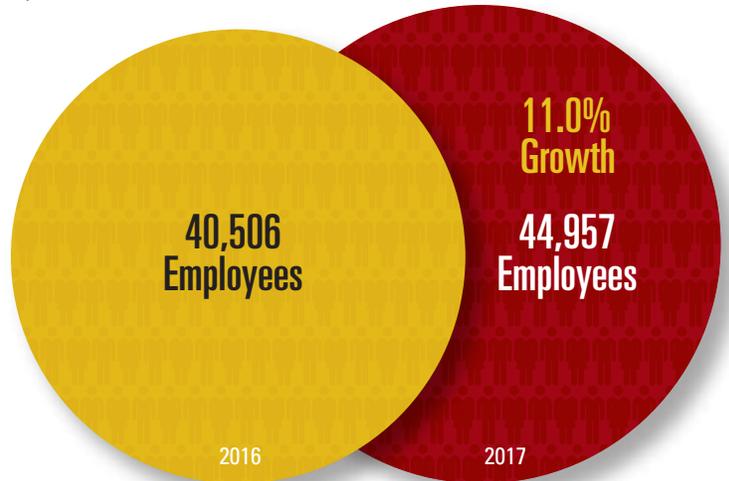


\* 2018 data based on projection from the first two quarters.

Source: Rock Health Digital Health Funding Database.

## Life Sciences Employment Trends in Orange County

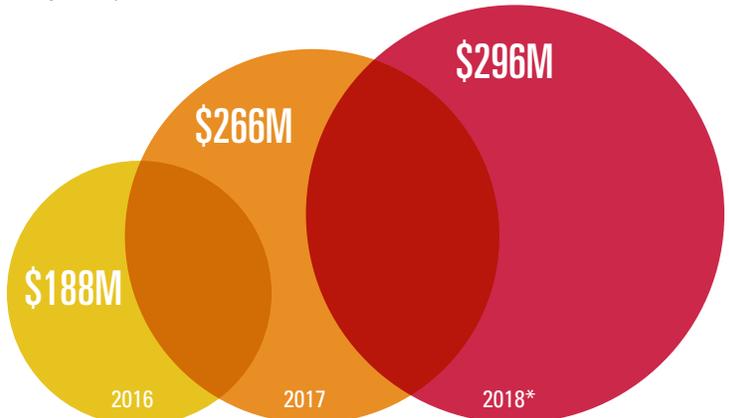
by Cluster, 2016-2017



Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages; 2012

## Life Sciences VC Investments in Orange County

Orange County Metro Area\*\*



\*2018 data based on projection from the first two quarters. \*\*Covers VC Investments in Orange and Riverside Counties. Source: PwC/CB Insights MoneyTree™ Report

## Staying Strong

As we look at the steady growth of the life sciences sector in California, we cannot lose sight of the factors that got us here. As a state, we must continue to grow our academic infrastructure. That means supporting higher education, research and K through 12 STEM programs. We must also refocus our efforts on STEM education for women and underserved communities.

Taxation is always an important concern, and we should be on guard against proposals that could hinder biomedical innovation. This is critically important for both the health of our economy and the health of our nation.

But perhaps the most important goal is to ensure that all patients have access to the medicines, devices and diagnostics that are being produced in our state and elsewhere. No one should ever be denied the care they need.

As strong as California's life sciences ecosystem has become, we must always be aware of the growing communities in Europe, China and other regions that are also embracing biological innovation. Many Californians have worked hard to get the industry to this level. We must continue that commitment to maintain our leadership position on the world stage and being the center of innovation.

## Ripple Effect

The life sciences industry footprint extends well beyond the institutions conducting innovative research and the businesses commercializing new products. Dozens of related industries generate jobs and expansive economic activity throughout California. While the industry directly employs 311,000, there are 647,000 more Californians whose jobs are connected to the life sciences enterprise. These are computer programmers, construction workers, consultants, distribution trades, attorneys and many others who are supported by the biomedical presence in their community. In addition, California's direct life sciences employees and companies pay more than \$18 billion in federal, state and local taxes.

**958,000**  
Total Direct,  
Indirect &  
Induced  
Employment



**Indirect & Induced  
Employment  
647,000**

## About California Life Sciences Association (CLSA)

California Life Sciences Association (CLSA) is the state's largest and most influential life sciences advocacy and business leadership organization. With offices in Sacramento, San Diego, South San Francisco, Los Angeles and Washington DC, CLSA works closely with industry, government, academia and others to shape public policy, improve access to innovative technologies and grow California's life sciences economy. CLSA serves biotechnology, pharmaceutical, medical device and diagnostics companies, research universities and institutes, investors and service providers throughout the Golden State. CLSA was founded in 2015 when the Bay Area Bioscience Association (BayBio) and the California Healthcare Institute (CHI) merged. Visit CLSA at [www.califesciences.org](http://www.califesciences.org), and follow us on Twitter [@CALifeSciences](https://twitter.com/CALifeSciences), Facebook, Instagram, LinkedIn and YouTube.

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PwC's Pharmaceutical and Life Sciences Industry Group helps organizations—from biopharmaceutical and medical technology firms to generic manufacturers—better connect to consumer needs to develop and deliver the treatments of tomorrow. We work with clients to uncover their most valuable strengths, identify complementary partnerships and keep up with the latest advances in technology, so they can better compete in an evolving health market and improve cost-efficiency and profitability. For more information visit [www.pwc.com/us/pharma](http://www.pwc.com/us/pharma).

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