



BIOCOM

2020 CALIFORNIA ECONOMIC IMPACT REPORT DATA BOOK

Providing Key Statistics and Information
on California's Life Science Industry

Prepared By: Clower & Associates

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California's Life Science industry is a critical economic engine and Biocom's 1,300+ members contribute greatly to the state by discovering life-changing solutions while providing well-paying jobs and cross-industry partnerships that fortify the state gross product.

While there is a strong life science presence across California, much of the industry is concentrated in several distinct regions of robust economic activity. By studying the state as a whole, as well as each region individually, Biocom is able to better communicate industry needs to local, state and federal representatives, as well as better tailor our services to accelerate each of our members' unique missions.

Biocom is the leader and advocate for California's life science sector. We work on behalf of more than 1,300 members to drive public policy, build an enviable network of industry leaders, create access to capital, introduce cutting-edge STEM education programs, and create robust value-driven purchasing programs.

Founded in 1995 in San Diego, Biocom provides the strongest public voice to research institutions and life science companies that fuel the local and state-wide economy. Our goal is simple: to help our members produce novel solutions that improve the human condition. In addition to our San Diego headquarters, Biocom operates core offices in Los Angeles and the San Francisco Bay Area, satellite offices in Washington, D.C. and Tokyo, and has a continuous staff presence in Sacramento. Our broad membership benefits apply to biotechnology, pharmaceutical, medical device, genomics and diagnostics companies of all sizes, as well as to research universities and institutes, clinical research organizations, investors and service providers.

For more information on Biocom, please visit our website at www.biocom.org. Connect with us on LinkedIn, Facebook, and Twitter (@BIOCOMCA).

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Introduction

The 2020 Biocom California Economic Impact Report Databook provides key economic, demographic, and industry performance data and analysis for the Life Sciences industry in California and selected sub-state regions. The Life Sciences industry remains a cornerstone of California's innovation eco-system driving growth and opportunities for businesses, suppliers and entrepreneurs. The increasing integration between technology and life sciences is a hallmark of recent industry trends and is a prism through which to consider emerging industry opportunities.

The way we categorize business activities, Life Sciences is trying to keep pace with industry change. The 2020 Databook used the same industry and cluster categories as the 2019 Databook, however, comparisons with data from years before 2019 should be made with caution due to changes in industries definitions, analytical assumptions, and data sources. A detailed listing of the industries included in this analysis can be found in Appendix 1.

While still a mainstay of the California economy, the overall economic development context does matter – even for the robust Life Sciences industry. Competition for investment and business opportunity in Life Sciences is growing outside of California. For California to remain at the forefront of Life Sciences-based economic development, state and local governments need to consider how to enhance investment, entrepreneurial growth, and business retention of firms within this critical sector of the state's economy.

This data is being prepared in the midst of the global COVID-19 pandemic and the full economic impact from the crisis is unknown. In the month of April 2020, the national economy lost over 20 million net jobs with impacts that touched almost every sector of the economy. We must caution readers to consider how current and near-term economic conditions may influence future Life Science industry growth. The pandemic has put into sharp focus the need to continue to have public and private investments in Life Sciences that allow rapid and effective responses to health challenges and crises, the deployment and adoption of new technologies, and cross-industry/cross-disciplinary approaches to research and Life Sciences business development. We are confident that the Life Sciences industry will remain a highly valuable economic contributor to California and its regions as we search for credible health solutions to the COVID-19 pandemic, but the exact timing of economic recovery and resumed growth is, for now, uncertain.

The Life Sciences industry is comprised of five (5) industry clusters, which themselves are groupings of industries. The industry clusters making up the Life Sciences industry in California includes: BioRenewables; Biopharmaceuticals Manufacturing; Medical Devices and Diagnostic Equipment Manufacturing; Life Sciences Wholesale Trade; and Research, Development, and Education Laboratory Services.

- **BioRenewables:** This industry cluster includes biofuels, specialty enzymes and chemicals, algae research, and key elements of agriculture.
- **Biopharmaceuticals Manufacturing:** The production of medicines, botanicals, pharmaceuticals, in-vitro diagnostic substances, and biological products.
- **Medical Devices and Diagnostic Equipment Manufacturing:** Laboratory equipment and supplies, optical instruments, electromedical apparatus, surgical and medical instruments, dental equipment, and dental product producing laboratories.
- **Life Sciences Wholesale Trade:** Wholesaling and distributing medical equipment and supplies and the wholesaling of pharmaceuticals and related products.
- **Research, Development, and Education Laboratory Services (referred to throughout the report as Research & Lab Services):** Includes research and development in biotechnology, related areas of nanotechnology, medical laboratories, and portions of industries representing testing laboratories, other research and development services, and higher education.

Economic & Demographic Overview

Population

- Population growth in California is about the same as the national average, reflecting increased domestic outmigration.
- The Bay Area continues to grow faster than state and national averages as Silicon Valley remains a top destination for talented young workers.
- There are substantial differences in population growth rates among Bay Area counties, which in part is driven by housing creation limitations. It is unclear if the latest population estimates were affected by extreme wildfire events.
- Riverside and San Diego Counties are leading population growth among Southern California regions.

Geography	1 July 2010	1 July 2019	Change	Percent Annual Change
United States	309,321,666	328,239,523	18,917,857	0.7%
California	37,319,502	39,512,223	2,192,721	0.6%
Bay Area	7,165,155	7,739,378	574,223	0.9%
Alameda County	1,512,986	1,671,329	158,343	1.1%
Contra Costa County	1,052,540	1,153,526	100,986	1.0%
Marin County	252,904	258,826	5,922	0.3%
Napa County	136,759	137,744	985	0.1%
San Francisco County	805,505	881,549	76,044	1.0%
San Mateo County	719,699	766,573	46,874	0.7%
Santa Clara County	1,786,040	1,927,852	141,812	0.9%
Solano County	413,967	447,643	33,676	0.9%
Sonoma County	484,755	494,336	9,581	0.2%
Southern California	19,143,018	20,050,896	907,878	0.5%
Imperial County	174,716	181,215	6,499	0.4%
Los Angeles County	9,823,246	10,039,107	215,861	0.2%
Orange County	3,015,171	3,175,692	160,521	0.6%
Riverside County	2,201,576	2,470,546	268,970	1.3%
San Diego County	3,103,212	3,338,330	235,118	0.8%
Ventura County	825,097	846,006	20,909	0.3%
City of Los Angeles	3,797,144	3,990,469	193,325	0.6%
City of San Diego	1,311,886	1,425,999	114,113	0.9%

Sources: US, State, Regions and Counties: US Census Population Estimates Program, Data for July 1 of the designated year. Cities: American Community Survey for 2018.

Employment

The data shown for employment counts are based on estimates from Economic Modeling Specialist Incorporated (EMSI). This data source offers two distinct advantages over government data sources such as the U.S. Bureau of Labor Statistics (BLS). First, government disclosure rules require the BLS to mask employment data for sectors with few firms in a given locality to protect business confidentiality. EMSI has developed algorithms to estimate job counts and other data from overall industry and regional hiring patterns without masking. Secondly, EMSI's models estimate non-employer jobs, such as sole proprietors and independent contractors, which are not included in timely government jobs data. This is a particularly important consideration for capturing the economic activity of small, innovative firms in the Life Sciences industry and the growth of "gig" economy-type jobs.

Total Employment

- Even with slowing population growth, total employment growth in California continues to outpace national averages.
- California companies, on average, pay substantially higher wages compared to the U.S.
- Over the past five years, total Bay Area job change was 12 percent.
- Southern California shows strong job growth totaling just over 9 percent since 2014.

	Employment 2014	Job Change (2014-2019)	Employment 2019	Job Change (2019-2024)	Employment 2024	Avg Annual Wage
United States	153,497,119	11,202,519	164,699,638	8,835,533	173,535,171	\$67,979
California	18,104,223	1,835,426	19,939,649	1,191,877	21,131,526	\$80,452
Bay Area	3,978,111	484,587	4,462,698	309,586	4,772,284	\$116,799
Alameda County	787,600	102,619	890,219	56,363	946,582	\$89,644
Contra Costa County	395,646	33,513	429,159	20,660	449,819	\$80,730
Marin County	134,168	4,620	138,788	5,339	144,127	\$83,110
Napa County	81,517	6,954	88,471	5,211	93,682	\$68,811
San Francisco County	716,413	118,976	835,389	84,640	920,029	\$139,980
San Mateo County	416,486	39,976	456,462	27,601	484,063	\$137,961
Santa Clara County	1,075,557	141,497	1,217,054	86,673	1,303,727	\$148,861
Solano County	148,800	16,698	165,498	10,354	175,852	\$72,781
Sonoma County	221,924	19,735	241,659	12,744	254,403	\$66,380
Southern California	9,233,736	852,353	10,086,089	512,434	10,598,523	\$72,669
Imperial County	70,727	-47	70,680	3,083	73,763	\$53,158
Los Angeles County	4,809,991	370,786	5,180,777	224,437	5,405,214	\$75,608
Orange County	1,659,725	177,908	1,837,633	95,929	1,933,562	\$73,464
Riverside County	730,912	130,012	860,924	79,113	940,037	\$56,129
San Diego County	1,600,190	157,629	1,757,819	92,548	1,850,367	\$73,316
Ventura County	362,190	16,067	378,257	17,323	395,580	\$66,841

Source: EMSI, Clower & Associates

The following series of tables provide detailed job growth estimates and projections by industry.

Employment by Industry -- California

NAICS	Industry	Employment 2014	Job Change (2014-2019)	Employment 2019	Job Change (2019-2024)	Employment 2024
11	Agriculture, Forestry, Fishing & Hunting	448,414	12,726	461,140	15,377	476,518
21	Mining, Quarrying, Oil & Gas Extraction	29,244	-8,167	21,077	197	21,274
22	Utilities	58,252	-876	57,376	-808	56,568
23	Construction	914,189	220,765	1,134,954	104,391	1,239,345
31	Manufacturing	1,308,764	62,402	1,371,166	-35,842	1,335,323
42	Wholesale Trade	738,251	-14,777	723,474	-17,459	706,014
44	Retail Trade	1,738,583	46,033	1,784,615	14,378	1,798,994
48	Transportation & Warehousing	513,830	197,622	711,452	85,469	796,921
51	Information	495,183	84,106	579,289	47,459	626,748
52	Finance & Insurance	590,285	28,804	619,088	6,605	625,694
53	Real Estate & Rental & Leasing	351,773	39,842	391,615	18,343	409,958
54	Professional, Scientific, & Technical Services	1,420,450	161,073	1,581,523	138,193	1,719,716
55	Management of Companies & Enterprises	225,792	29,358	255,150	16,460	271,611
56	Administrative & Support & Waste Management & Remediation Services	1,183,571	115,345	1,298,916	71,473	1,370,390
61	Educational Services	445,607	58,365	503,972	50,787	554,759
62	Health Care & Social Assistance	2,171,820	356,328	2,528,148	394,875	2,923,023
71	Arts, Entertainment, & Recreation	366,681	52,586	419,268	29,209	448,476
72	Accommodation & Food Services	1,515,280	217,514	1,732,794	165,925	1,898,719
81	Other Services (except Public Administration)	891,833	54,798	946,631	20,572	967,203
92	Public Administration	2,635,682	178,230	2,813,911	70,334	2,884,246
99	Unclassified	60,740	-56,650	4,090	-4,061	29
	Total - All Industries	18,104,223	1,835,426	19,939,649	1,191,877	21,131,526

Source: EMSI, Clower & Assoc.

Employment by Industry – Bay Area

NAICS	Industry	Employment 2014	Job Change (2014-2019)	Employment 2019	Job Change (2019-2024)	Employment 2024
11	Agriculture, Forestry, Fishing & Hunting	22,504	226	22,730	161	22,891
21	Mining, Quarrying, & Oil & Gas Extraction	1,691	-453	1,238	158	1,397
22	Utilities	14,213	-119	14,094	-831	13,263
23	Construction	205,416	50,046	255,462	25,582	281,043
31	Manufacturing	327,443	44,118	371,561	5,571	377,131
42	Wholesale Trade	128,291	-4,879	123,412	-7,275	116,137
44	Retail Trade	354,905	4,021	358,926	480	359,406
48	Transportation & Warehousing	96,853	28,170	125,023	9,518	134,541
51	Information	154,285	73,110	227,395	44,543	271,938
52	Finance & Insurance	134,419	12,169	146,588	3,827	150,415
53	Real Estate & Rental & Leasing	74,820	9,027	83,848	4,151	87,998
54	Professional, Scientific, & Technical Services	471,868	80,504	552,373	62,701	615,073
55	Management of Companies & Enterprises	73,267	4,601	77,868	4,266	82,134
56	Administrative & Support & Waste Management & Remediation Services	227,592	19,443	247,036	10,111	257,147
61	Educational Services	125,111	14,512	139,624	13,728	153,352
62	Health Care & Social Assistance	462,440	62,512	524,953	73,643	598,595
71	Arts, Entertainment, & Recreation	77,304	7,519	84,823	5,002	89,825
72	Accommodation & Food Services	337,796	45,415	383,212	36,099	419,311
81	Other Services (except Public Administration)	199,255	17,605	216,860	8,161	225,021
92	Public Administration	476,840	28,124	504,964	10,697	515,661
99	Unclassified	11,795	-11,085	710	-705	<10
	Total - All Industries	3,978,111	484,587	4,462,698	309,586	4,772,284

Source: EMSI, Clower & Assoc.

Employment by Industry – Southern California

NAICS	Industry	Employment 2014	Job Change (2014-2019)	Employment 2019	Job Change (2019-2024)	Employment 2024
11	Agriculture, Forestry, Fishing & Hunting	74,954	-3,257	71,697	-566	71,131
21	Mining, Quarrying, & Oil & Gas Extraction	7,979	-3,319	4,659	-247	4,413
22	Utilities	24,472	-1,785	22,686	-1,122	21,564
23	Construction	456,001	106,243	562,244	47,571	609,814
31	Manufacturing	712,145	-530	711,615	-47,245	664,370
42	Wholesale Trade	401,088	-1,980	399,108	-15,241	383,866
44	Retail Trade	899,434	23,410	922,844	4,375	927,219
48	Transportation & Warehousing	251,552	97,265	348,817	41,975	390,791
51	Information	284,175	8,371	292,546	1,381	293,927
52	Finance & Insurance	319,041	8,254	327,295	-2,567	324,728
53	Real Estate & Rental & Leasing	205,405	20,483	225,888	9,052	234,940
54	Professional, Scientific, & Technical Services	692,085	55,606	747,691	47,381	795,072
55	Management of Companies & Enterprises	113,903	19,324	133,228	10,729	143,957
56	Administrative & Support & Waste Management & Remediation Services	614,644	59,002	673,646	31,401	705,047
61	Educational Services	241,092	32,301	273,393	26,901	300,294
62	Health Care & Social Assistance	1,138,113	190,871	1,328,984	215,920	1,544,904
71	Arts, Entertainment, & Recreation	220,018	36,357	256,375	19,240	275,615
72	Accommodation & Food Services	810,916	120,951	931,867	90,338	1,022,205
81	Other Services (except Public Administration)	478,641	27,727	506,368	7,306	513,674
92	Public Administration	1,257,712	85,653	1,343,365	27,624	1,370,989
99	Unclassified	30,367	-28,593	1,774	-1,769	<10
	Total - All Industries	9,233,736	852,353	10,086,089	512,434	10,598,523

Source: EMSI, Clower & Assoc.

Employment by Industry – San Diego County

NAICS	Industry	Employment 2014	Job Change (2014-2019)	Employment 2019	Job Change (2019-2024)	Employment 2024
11	Agriculture, Forestry, Fishing & Hunting	11,257	-279	10,978	366	11,344
21	Mining, Quarrying, & Oil & Gas Extraction	462	-93	370	-6	364
22	Utilities	5,781	-895	4,886	-430	4,456
23	Construction	83,083	22,233	105,317	8,730	114,047
31	Manufacturing	100,300	16,851	117,150	2,318	119,468
42	Wholesale Trade	45,591	-35	45,556	-2,523	43,033
44	Retail Trade	152,380	3,525	155,904	591	156,495
48	Transportation & Warehousing	24,128	11,427	35,556	4,548	40,104
51	Information	26,357	-576	25,780	-810	24,971
52	Finance & Insurance	49,974	4,196	54,170	1,134	55,305
53	Real Estate & Rental & Leasing	35,317	2,502	37,818	1,007	38,825
54	Professional, Scientific, & Technical Services	150,973	16,076	167,048	15,560	182,609
55	Management of Companies & Enterprises	21,319	2,573	23,892	2,192	26,084
56	Administrative & Support & Waste Management & Remediation Services	92,213	8,118	100,331	2,692	103,023
61	Educational Services	37,413	891	38,304	3,086	41,389
62	Health Care & Social Assistance	164,262	26,847	191,110	28,523	219,632
71	Arts, Entertainment, & Recreation	33,980	4,686	38,666	2,529	41,195
72	Accommodation & Food Services	152,315	21,364	173,679	15,733	189,413
81	Other Services (except Public Administration)	77,578	6,388	83,965	2,356	86,321
92	Public Administration	330,892	16,148	347,040	5,249	352,289
99	Unclassified	4,615	-4,318	297	-292	<10
	Total - All Industries	1,600,190	157,629	1,757,819	92,548	1,850,367

Source: EMSI, Clower & Assoc.

Employment by Industry – Orange County

NAICS	Industry	Employment 2014	Job Change (2014-2019)	Employment 2019	Job Change (2019-2024)	Employment 2024
11	Agriculture, Forestry, Fishing & Hunting	3,042	-813	2,229	-805	1,424
21	Mining, Quarrying, & Oil & Gas Extraction	776	-236	540	55	595
22	Utilities	3,350	-302	3,049	-292	2,757
23	Construction	101,311	26,863	128,173	12,368	140,541
31	Manufacturing	162,092	2,388	164,480	-7,822	156,658
42	Wholesale Trade	84,722	-2,676	82,046	-3,531	78,515
44	Retail Trade	158,735	3,544	162,279	-402	161,877
48	Transportation & Warehousing	25,952	5,726	31,678	1,419	33,097
51	Information	26,050	2,745	28,795	-5	28,789
52	Finance & Insurance	86,210	2,279	88,490	-11	88,478
53	Real Estate & Rental & Leasing	47,648	2,810	50,459	1,392	51,851
54	Professional, Scientific, & Technical Services	147,126	10,476	157,602	8,855	166,457
55	Management of Companies & Enterprises	28,539	8,909	37,448	4,306	41,753
56	Administrative & Support & Waste Management & Remediation Services	137,098	29,238	166,335	15,330	181,665
61	Educational Services	34,028	6,583	40,612	5,209	45,821
62	Health Care & Social Assistance	173,112	33,331	206,444	32,117	238,560
71	Arts, Entertainment, & Recreation	49,761	10,141	59,902	5,083	64,985
72	Accommodation & Food Services	152,989	23,215	176,204	15,751	191,955
81	Other Services (except Public Administration)	75,933	7,665	83,598	3,506	87,104
92	Public Administration	155,882	11,037	166,919	3,759	170,677
99	Unclassified	5,369	-5,018	351	-346	<10
	Total - All Industries	1,659,725	177,908	1,837,633	95,929	1,933,562

Source: EMSI, Clower & Assoc.

Employment by Industry – Los Angeles County

NAICS	Industry	Employment 2014	Job Change (2014-2019)	Employment 2019	Job Change (2019-2024)	Employment 2024
11	Agriculture, Forestry, Fishing & Hunting	6,059	-503	5,556	-1,076	4,481
21	Mining, Quarrying, & Oil & Gas Extraction	4,805	-2,766	2,038	-290	1,748
22	Utilities	12,153	-228	11,925	-387	11,537
23	Construction	185,654	31,873	217,527	14,542	232,069
31	Manufacturing	373,914	-20,559	353,355	-41,354	312,001
42	Wholesale Trade	230,870	-1,508	229,362	-9,982	219,380
44	Retail Trade	446,434	8,277	454,711	-144	454,567
48	Transportation & Warehousing	164,672	58,583	223,255	26,836	250,092
51	Information	218,012	6,421	224,433	2,064	226,496
52	Finance & Insurance	151,393	4,119	155,513	-2,736	152,777
53	Real Estate & Rental & Leasing	102,169	13,839	116,008	6,019	122,027
54	Professional, Scientific, & Technical Services	343,386	24,964	368,350	19,445	387,794
55	Management of Companies & Enterprises	58,823	2,689	61,512	496	62,008
56	Administrative & Support & Waste Management & Remediation Services	311,677	9,926	321,604	6,180	327,783
61	Educational Services	152,622	21,800	174,422	16,208	190,630
62	Health Care & Social Assistance	666,557	99,764	766,321	124,039	890,360
71	Arts, Entertainment, & Recreation	114,597	19,349	133,946	10,248	144,194
72	Accommodation & Food Services	399,675	58,917	458,591	45,888	504,480
81	Other Services (except Public Administration)	271,149	10,076	281,225	-504	280,722
92	Public Administration	578,081	42,077	620,158	9,910	630,068
99	Unclassified	17,289	-16,324	965	-960	<10
	Total - All Industries	4,809,991	370,786	5,180,777	224,437	5,405,214

Source: EMSI, Clower & Assoc.

Education

Education Attainment

Having an educated workforce is a necessary condition for success in the globalized economy. Economic development in the 21st Century is largely about talent attraction, development, and retention. The data reported for education attainment covers the adult population aged 25 years or older and come from the U.S. Census Bureau's American Community Survey.

- The Bay Area can boast that almost one-half of their adult population possesses at least a bachelor's degree.
- In Southern California, Los Angeles County, Orange County, San Diego County and Ventura Counties have strong overall education attainment numbers.

	Graduate or Professional Degree	Bachelor's Degree	Associate's Degree	Some College	High School Diploma	Less than High School
United States	12.6%	20.0%	8.6%	20.3%	26.9%	11.7%
California	12.9%	21.3%	8.0%	20.8%	20.7%	16.2%
Bay Area	20.8%	28.3%	7.2%	17.5%	15.8%	5.3%
Alameda County	20.8	27.5	6.2	16.9	18.1	10.5
Contra Costa County	16.9	26.7	8.7	20.6	17.3	9.8
Marin County	27.6	33.9	7.3	14.8	10.2	6.3
Napa County	11.2	23.6	10.4	21.6	18.9	14.3
San Francisco County	23.7	36.1	5	12.5	12.2	10.4
San Mateo County	22.3	30.2	6.3	17.0	14.4	9.7
Santa Clara County	25.4	28.4	7.3	14.5	13.7	10.8
Solano County	8.9	18.7	9.9	28.1	23.4	10.8
Sonoma County	14.2	22.0	9.5	24.9	18.2	11.2
Southern California	12.1%	21.5%	7.6%	20.5%	20.7%	17.6%
Imperial County	4.6	9.5	6.2	24.1	25.5	30.0
Los Angeles County	11.2	21.3	7.1	19.1	20.6	20.6
Orange County	14.7	26.4	7.8	20.1	17.2	13.9
Riverside County	8.1	14.2	8.2	23.7	29.3	16.7
San Diego County	15.3	23.1	8.2	22.3	18.5	12.7
Ventura County	12.1	20.3	10.1	22.4	20.3	14.7
City of Los Angeles*	11.6	22.8	6.1	17.8	19.2	22.4
City of San Diego*	18.5	27.1	7.8	19.7	15.6	11.2

Source: Census Bureau, American Community Survey, 2018. *2017 most recent available data, Population aged 25+, Clower & Assoc.

Total Post-Secondary Degrees Awarded

Post-Secondary Degrees Awarded reflect college diplomas awarded at public and private institutions of higher education, including specialty trade schools. This data help reflect a region's ability to provide an on-going supply of trained workers and scientists supporting industry growth.

- Growth in the issuance of post-secondary degrees in Southern California universities and colleges continues a long-term trend of outperforming national averages.
- Institutions in Marin, San Francisco and the City of San Diego experienced a drop in degrees awarded between 2013 and 2018.
- It is likely that some of the declines in degrees awarded reflect intra-regional competition among universities and colleges.

	2013	2018	Change	Percent Change
United States	4,916,440	5,173,251	256,811	5%
California	571,213	669,746	98,533	17%
Bay Area	102,433	113,396	10,963	11%
Alameda County	27,219	32,044	4,825	18%
Contra Costa County	7,945	10,144	2,199	28%
Marin County	1,066	947	-119	-11%
Napa County	1,146	2,058	912	80%
San Francisco County	23,685	20,791	-2,894	-12%
San Mateo County	4,299	5,604	1,305	30%
Santa Clara County	27,110	30,597	3,487	13%
Solano County	2,615	2,769	154	6%
Sonoma County	7,348	8,442	1,094	15%
Southern California	322,952	392,160	69,208	21%
Imperial County	1,760	2,277	517	29%
Los Angeles County	159,721	190,483	30,762	19%
Orange County	59,666	81,622	21,956	37%
Riverside County	19,499	25,934	6,435	33%
San Diego County	73,815	77,410	3,595	5%
Ventura County	8,491	14,434	5,943	70%
City of Los Angeles	50,493	56,577	6,084	12%
City of San Diego	43,762	36,785	-6,977	-16%

Source: Integrated Post-Secondary Education Data System aggregated by EMSI, Clower & Assoc.

Life Sciences Talent Pipeline

Degrees awarded in Science, Technology, Engineering, and Mathematics (STEM) is considered especially important for California's technology industries, including Life Sciences.

- California institutions of higher learning, including continuing to have success in promoting STEM program graduations. This includes public and private institutions at all degree levels (associate, bachelors, graduate).
- Contra Costa County shows especially high growth in STEM degrees awarded, continuing a trend observed in previous analyses. Imperial County continues to make progress in this area.
- The only county to slip in STEM degree graduates was Marin County, which reflects declines in two disciplines.
- Ventura County also recorded a large percentage increase between 2013 and 2018, which gave the Southern California Counties a performance edge for this metric.

	2013	2018	Change	Percent Change
United States	701,330	923,942	222,612	32%
California	85,595	123,116	37,521	44%
Bay Area	18,099	26,070	7,971	44%
Alameda County	6,192	8,844	2,652	43%
Contra Costa County	680	1,793	1,113	164%
Marin County	155	114	-41	-26%
Napa County	209	306	97	46%
San Francisco County	2,748	3,881	1,133	41%
San Mateo County	304	515	211	69%
Santa Clara County	6,687	8,924	2,237	33%
Solano County	470	562	92	20%
Sonoma County	654	1,131	477	73%
Southern California	42,786	63,301	20,515	48%
Imperial County	228	336	108	47%
Los Angeles County	20,856	30,169	9,313	45%
Orange County	7,462	10,939	3,477	47%
Riverside County	3,112	5,433	2,321	75%
San Diego County	10,047	14,458	4,411	44%
Ventura County	1,081	1,966	885	82%
City of Los Angeles	9,063	12,837	3,774	42%
City of San Diego	3,326	4,438	1,112	33%

Source: Integrated Post-Secondary Education Data System aggregated by EMSI

Life Sciences Employment, Competitiveness and Impacts

For each selected geography, we offer data indicating the status, competitiveness, and economic impacts of the Life Sciences industry and its component industry clusters. The following describes the data and analyses presented.

- Employment: Employment totals include estimates of jobs provided by employers (covered employment) and individuals who are self-employed or employed as an independent contractor.
- Establishments: Firms with one or more employees (not including a sole proprietor) by location. For example, some firms may have multiple locations within a county each of which would be counted as an “establishment” because it would file separate employment status reports with government agencies. Please note that data on establishments for city level analyses are not from the same database as county level assessments. The city level data are obtained through a private sector business information listing. Companies can choose not to have their information shown in these databases, therefore, our estimates may understate the total number of relevant establishments in the City of San Diego and the City of Los Angeles.
- Wages: For our sub-state regions, we show the average wages per year for all employees by industry cluster.
- Employment by Selected Occupations: The number of jobs in occupations that are particularly relevant to the Life Sciences.
- Location Quotient: A location quotient shows the proportion of total employment in a given industry or occupation compared to the average representation of that industry or occupation in the United States economy. A location quotient greater than 1.2 indicates that a region may possess a competitive advantage for that industry/occupation. Location quotients less than 0.9 typically indicate competitive weakness but may show opportunities for growth.¹
- Industry Competitiveness: This measure is based on a shift-share analysis of the jobs data. Shift-share analyses separate employment change into factors that account for: a) overall economic change in the United States (if the overall economy is growing, so should a given industry), and b) the given industry's trends at the national level. We show this analysis by comparing Expected Change to Regional Share. Expected Change is the sum of national level influences on local industry employment. Regional Share shows the number of jobs during a five-year period that can be attributed to local/regional/state economic conditions. Any Regional Share above zero indicates that this industry is growing faster than national trends. The larger the Regional Share compared to Expected Change, the more competitive the region is for that industry, on average.

¹ Please note that we made a slight adjustment to our methodology for calculating the location quotient to better reflect adjustments we make to industry employment data within the Life Science clusters. This adjustment resulted in minor but not practically meaningful variations in the reported location quotients.

- Economic Impacts:** Economic Impacts show how the selected industry impacts overall local/regional/state economic performance. Our measures include direct, indirect, and induced impacts. Direct impacts capture the value of firm spending, such as a medical device Manufacturing hiring employees and purchasing raw materials and component parts. Indirect effects measure the economic value as it flows through the medical devices firm's supply chain, such as a parts supplier purchasing shipping boxes and transportation services, hiring workers, and obtaining professional services. Induced effects capture the impacts of employees of the direct and indirect firms spending a portion of their earnings for goods and services in the state/regional/local economy. These impacts are measured for:

 - Output: Value of business transactions
 - Value added: Equivalent to gross domestic product
 - Labor Income: Salaries, wages and benefits paid to workers
 - Employment: Headcount (full-time and part-time) jobs
- Foreign Exports:** The value of goods and services sold to buyers outside the United States. This is a very important economic measure since the sale of export goods brings new money into the state/regional/local economy.
- National Institutes of Health New Research Awards:** This reports the value of research grants awarded in the field of health research for federal fiscal year 2019 from the National Institutes of Health (NIH). This is a proxy measure for how a region is performing in leading edge Life Sciences research.

California

Summary

California's Life Sciences Industry provides over 481,000 jobs statewide, most of which are employed at one of the more than 15,000-plus establishments representing this sector of the economy. Medical Scientists and General Biologists dominate job growth with some occupations showing only moderate growth and specified environmental sciences-related jobs declining over the past five years.

At the state level, California's Life Sciences industry has grown impressively over the past five years with a 13% increase in the number of jobs. However, the shift-share analysis indicates that the state is seeing notable differences in competitiveness among the Life Sciences clusters. California remains particularly competitive in the Research & Lab Services cluster and in Medical Devices. However, the state's previously competitive Trade sector is now just keeping pace with national averages, and Pharmaceuticals Manufacturing has lost ground and employees over the past five years. Still, Life Sciences companies, universities and research institutions in California received almost \$4.6 billion in new research awards from the National Institutes for Health in FY2019. California based Life Sciences companies exported over \$100 billion in goods and services in 2019.

Including direct, indirect, and induced economic impacts, the Life Sciences Industry in California:

- Generates over \$372 billion in annual economic activity (output)
- Boosts total state gross product by almost \$212 billion
- Supports over 1.4 million jobs
- Increases labor income by more than \$115 billion per year

California Employment by Life Sciences Cluster, 2019

Industry Cluster	Employment
BioRenewables	30,686
Biopharmaceutical Manufacturing	47,415
Medical Devices and Diagnostic Equipment	89,731
Life Science Wholesale	59,517
Research & Lab Services	254,539
TOTAL LIFE SCIENCE INDUSTRY	481,888

Source: EMSI, Clower & Assoc.

California Life Sciences Establishments, 2019

Industry Cluster	Establishments
BioRenewables	1,528
Biopharmaceutical Manufacturing	678
Medical Devices and Diagnostic Equipment	2,441
Life Science Wholesale	4,510
Research & Lab Services	6,184
TOTAL LIFE SCIENCE INDUSTRY	15,341

Source: EMSI, Clower & Assoc.

California Wages by Life Sciences Cluster, 2019, average annual

Industry Cluster	Wages
BioRenewables	\$48,764
Biopharmaceutical Manufacturing	\$194,466
Medical Devices and Diagnostic Equipment	\$134,885
Life Science Wholesale	\$134,337
Research & Lab Services	\$101,068
TOTAL LIFE SCIENCE INDUSTRY	\$117,333

Source: EMSI, Clower & Assoc.

California Employment by Selected Occupations

Title	2019 Jobs	Avg. Annual Wages	Location Quotient	2014-2019 Job Change
Biochemists and Biophysicists	5,419	\$102,081	1.44	139
Microbiologists	4,677	\$102,360	1.80	40
Zoologists & Wildlife Biologists	2,353	\$75,886	0.98	-171
Biological Scientists, All Other	11,561	\$91,398	2.07	3,943
Epidemiologists	800	\$92,044	0.83	186
Medical Scientists	26,961	\$102,867	1.72	6,138
Life Scientists, All Other	1,578	\$108,921	1.69	-397
Environmental Scientists and Specialists, Including Health	13,269	\$92,488	1.29	-1,828
Ag. & Food Science Techs	4,811	\$46,147	1.47	737
Biological Technicians	11,426	\$53,227	1.16	896
Chemical Technicians	6,214	\$48,277	0.77	-464
Environmental Science and Protection Techs, Inc. Health	5,410	\$60,545	1.26	-357
Life, Physical, and Social Science Technicians, All Other	7,400	\$57,522	0.90	173
Medical & Clinical Lab Technologists and Technicians	29,593	\$60,658	0.74	771

Source: EMSI, Clower & Assoc.

Industry Competitiveness – California

(The larger the Regional Share compared to Expected Change, the more competitive the industry)

	2014 Jobs	2019 Jobs	% Change	Expected Change	Regional Share
Total - All Industries	18,104,223	19,939,649	10.14%		
BioRenewables	31,802	30,686	-3.51%	-425	-691
Biopharmaceutical Manufacturing	47,796	47,415	-0.80%	3,411	-3,792
Medical Devices and Diagnostic Equipment	78,851	89,731	13.8%	6,474	4,407
Life Science Wholesale	47,518	59,517	25.25%	12,217	-218
Research & Lab Services	220,761	254,539	15.3%	17,197	16,581
All Life Sciences	426,727	481,887	12.93%	38,873	16,287

Source: EMSI, Clower & Assoc.

Economic Impacts (Direct, Indirect, Induced) California 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$45,634,582,938	\$16,899,406,240	\$10,177,394,052	172,901
Biopharmaceutical Manufacturing	\$124,789,262,863	\$73,231,193,384	\$28,360,473,198	289,748
Medical Devices and Diagnostic Equipment	\$74,166,096,959	\$39,421,874,820	\$23,240,197,363	268,946
Life Science Wholesale	\$27,518,894,769	\$17,952,489,010	\$9,637,002,665	132,883
Research & Lab Services	\$100,363,833,663	\$64,013,273,379	\$43,600,890,137	551,327
All Life Sciences	\$372,472,671,192	\$211,518,236,833	\$115,015,957,415	1,415,804

Source: EMSI, IMPLAN, Clower & Assoc.

California Foreign Exports of Life Sciences Products and Services 2019

Industry Cluster	Exports
BioRenewables	\$6,253,438,758
Biopharmaceutical Manufacturing	\$21,498,062,224
Medical Devices and Diagnostic Equipment	\$27,911,552,144
Life Science Wholesale	\$10,376,528,825
Research & Lab Services	\$36,943,245,184
TOTAL LIFE SCIENCE INDUSTRY	\$102,982,827,135

Source: EMSI, Clower & Assoc.

National Institutes of Health New Research Awards FY2019 – California

County	Total
Alameda	\$316,885,308
Contra Costa	\$6,556,527
El Dorado	\$350,000
Fresno	\$1,066,567
Kern	\$551,385
Los Angeles	\$1,154,270,720
Marin	\$18,125,407
Merced	\$7,369,525
Monterey	\$204,875
Napa	\$0
Orange	\$173,910,256
Placer	\$300,020
Riverside	\$31,258,811
Sacramento	\$2,056,574
San Bernadino	\$8,850,894
San Diego	\$1,011,656,214
San Francisco	\$847,093,032
San Joaquin	\$735,837
San Luis Obispo	\$1,354,928
San Mateo	\$100,158,656
Santa Barbara	\$24,312,554
Santa Clara	\$586,807,556
Santa Cruz	\$51,894,979
Solano	\$1,214,477
Sonoma	\$994,000
Ventura	\$1,555,745
Yolo	\$242,046,817
Total	\$4,591,581,664

Sources: NIH (April 2020), Clower & Associates

Bay Area

Summary

The Bay Area includes the nine counties surrounding the San Francisco Bay: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma counties. The Bay Area Life Sciences industry generates over \$90 billion of gross regional product and Bay Area companies in the Life Sciences industry employed more than 145,000 people in 2019², with average earnings over \$172,000 per year. There was impressive growth in the Biopharmaceuticals, Medical Devices and Research & Lab Services industry clusters between 2014 and 2019. The Research & Lab Services sector alone added over 17,000 new jobs over the five-year period. Life Sciences Wholesale showed good growth, while BioRenewables employment declined slightly. The largest growth was in Alameda, San Francisco and San Mateo counties.

Key Life Sciences occupations in the Bay Area include Biochemists and Biophysicists; Microbiologists; general Biological Scientists; Life Scientists and Medical Scientists, each of which has more than twice the industry concentration compared to national averages (LQ>2.0). The most competitive industry clusters are Biopharmaceuticals; Medical Devices and Diagnostic Equipment; and Research & Lab Services. Based on shift-share analyses, the Research & Lab Services cluster has been very competitive.

Total Life Sciences exports from the Bay Area exceeded \$65 billion in 2019. The region received over \$1.87 billion in new research awards from the National Institutes for Health in FY2019.

The economic impacts of the Life Sciences industry in the Bay Area:

- Generates over \$139.3 billion in annual economic activity (output)
- Boosts total gross regional product by \$90 billion
- Supports over 387,000 jobs
- Increases labor income by \$45.3 billion per year

Bay Area Life Sciences Employment

Life Sciences Employment by County	2019	Avg. Earnings
Bay Area	145,235	\$172,116
Alameda County	34,908	\$127,173
Contra Costa County	5,289	\$98,688
Marin County	3,359	\$256,114
Napa County	904	\$54,255
San Francisco County	19,139	\$147,260
San Mateo County	32,434	\$263,188
Santa Clara County	39,859	\$156,744
Solano County	5,039	\$207,507
Sonoma County	4,304	\$111,197

Source: EMSI, Clower & Assoc.

² Numbers across tables may not match because of rounding. The job counts for the Bay Area by cluster does not match the sum of the county level jobs. This is because job counts for some small industries are reported as a range (< 10 jobs). We substitute the value 5 in these cases, which causes the totals to vary by a few jobs.

Bay Area Employment by Life Sciences Cluster

Life Science Jobs by Sectors	2014	2019	2024
Bay Area			
BioRenewables	2,200	2,075	1,991
Biopharmaceutical Manufacturing	19,058	23,127	24,184
Medical Devices and Diagnostic Equipment	20,172	24,741	25,358
Life Science Wholesale	5,241	7,223	7,626
Research & Lab Services	70,668	88,024	99,274
All Life Sciences	117,339	145,190	158,433

Source: EMSI, Clower & Assoc.

Life Science Jobs by Sectors	2014	2019	2024
Alameda County			
BioRenewables	88	247	333
Biopharmaceutical Manufacturing	2,535	3,328	3,298
Medical Devices and Diagnostic Equipment	5,905	8,199	9,214
Life Science Wholesale	1,019	1,762	1,958
Research & Lab Services	16,916	21,372	23,681
All Life Sciences	26,463	34,908	38,484

Source: EMSI, Clower & Assoc.

Life Science Jobs by Sectors	2014	2019	2024
Contra Costa County			
BioRenewables	178	117	80
Biopharmaceutical Manufacturing	485	701	806
Medical Devices and Diagnostic Equipment	1,331	1,277	1,126
Life Science Wholesale	412	475	502
Research & Lab Services	2,873	2,719	2,889
All Life Sciences	5,279	5,289	5,403

Source: EMSI, Clower & Assoc.

Life Science Jobs by Sectors	2014	2019	2024
Marin County			
BioRenewables	36	14	9
Biopharmaceutical Manufacturing	1,313	2,369	2,993
Medical Devices and Diagnostic Equipment	131	91	100
Life Science Wholesale	198	163	147
Research & Lab Services	882	722	634
All Life Sciences	2,560	3,359	3,883

Source: EMSI, Clower & Assoc.

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Life Science Jobs by Sectors	2014	2019	2024
Napa County			
BioRenewables	401	366	342
Biopharmaceutical Manufacturing	97	10	10
Medical Devices and Diagnostic Equipment	137	85	77
Life Science Wholesale	32	33	34
Research & Lab Services	476	410	392
All Life Sciences	1,143	904	855

Source: EMSI, Clower & Assoc.

Life Science Jobs by Sectors	2014	2019	2024
San Francisco County			
BioRenewables	15	26	30
Biopharmaceutical Manufacturing	364	192	144
Medical Devices and Diagnostic Equipment	238	492	585
Life Science Wholesale	578	1,222	1,523
Research & Lab Services	13,954	17,207	20,126
All Life Sciences	15,149	19,139	22,408

Source: EMSI, Clower & Assoc.

Life Science Jobs by Sectors	2014	2019	2024
San Mateo County			
BioRenewables	258	194	142
Biopharmaceutical Manufacturing	9,562	9,929	9,695
Medical Devices and Diagnostic Equipment	2,130	2,149	2,046
Life Science Wholesale	646	866	834
Research & Lab Services	9,715	19,297	24,026
All Life Sciences	22,311	32,435	36,743

Source: EMSI, Clower & Assoc.

Life Science Jobs by Sectors	2014	2019	2024
Santa Clara County			
BioRenewables	435	373	318
Biopharmaceutical Manufacturing	1,563	3,153	3,725
Medical Devices and Diagnostic Equipment	8,665	10,293	10,012
Life Science Wholesale	1,870	2,128	2,004
Research & Lab Services	23,394	23,912	25,076
All Life Sciences	35,927	39,859	41,135

Source: EMSI, Clower & Assoc.

Life Science Jobs by Sectors	2014	2019	2024
Solano County			
BioRenewables	207	174	164
Biopharmaceutical Manufacturing	2,995	3,228	3,264
Medical Devices and Diagnostic Equipment	220	307	358
Life Science Wholesale	215	375	424
Research & Lab Services	931	954	1,004
All Life Sciences	4,568	5,038	5,214

Source: EMSI, Clower & Assoc.

Life Science Jobs by Sectors	2014	2019	2024
Sonoma County			
BioRenewables	600	560	575
Biopharmaceutical Manufacturing	169	231	257
Medical Devices and Diagnostic Equipment	1,450	1,878	1,883
Life Science Wholesale	270	198	200
Research & Lab Services	1,528	1,437	1,449
All Life Sciences	4,017	4,304	4,364

Source: EMSI, Clower & Assoc.

Life Sciences Industry Establishments by Cluster

Establishments by Sector & County, 2019						
	Bio-Renewables	Bio-Pharmaceutical Manufacturing	Medical Devices	Life Science Wholesale	Research & Lab Services	All Life Sciences
Bay Area	155	159	658	571	1,847	3,390
Alameda County	9	49	148	121	372	699
Contra Costa County	10	8	55	70	117	260
Marin County	4	6	15	25	40	90
Napa County	25	1	6	7	9	48
San Francisco County	4	11	44	76	305	440
San Mateo County	11	32	101	75	357	576
Santa Clara County	30	36	249	156	556	1,027
Solano County	14	7	13	16	41	91
Sonoma County	48	9	27	25	50	159

Source: EMSI, Clower & Assoc.

Wages in Life Sciences Clusters by County

Wages by Sector & County, 2019						
	Bio-Renewables	Bio-Pharmaceutical Manufacturing	Medical Devices	Life Science Wholesale	Research & Lab Services	All Life Sciences
Bay Area	\$57,907	\$277,149	\$176,387	\$141,391	\$137,451	\$172,132
Alameda	\$94,936	\$178,266	\$168,290	\$98,985	\$106,139	\$127,173
Contra Costa	\$56,534	\$155,675	\$103,475	\$111,639	\$81,299	\$98,688
Marin	\$55,711	\$321,764	\$111,354	\$151,502	\$86,455	\$256,114
Napa	\$62,560	Insf. Data	\$69,419	\$58,172	\$43,383	\$54,255
San Francisco	\$69,573	\$154,320	\$109,466	\$147,569	\$148,357	\$147,260
San Mateo	\$45,677	\$338,950	\$299,380	\$176,691	\$226,244	\$263,188
Santa Clara	\$63,069	\$196,684	\$181,802	\$184,445	\$139,738	\$156,774
Solano	\$51,841	\$283,194	\$77,188	\$62,404	\$78,774	\$207,507
Sonoma	\$52,597	\$72,733	\$169,182	\$83,805	\$68,210	\$111,197

Source: EMSI, Clower & Assoc.

Bay Area Employment by Selected Life Sciences Occupations

Title	2019 Jobs	Avg. Annual Wages	Location Quotient	2014-2019 Job Change
Biochemists and Biophysicists	2,651	\$111,495	3.16	310
Microbiologists	1,642	\$108,748	2.83	87
Zoologists and Wildlife Biologists	590	\$85,982	1.10	-76
Biological Scientists, All Other	4,548	\$97,821	3.64	1,904
Epidemiologists	256	\$100,081	1.19	66
Medical Scientists	10,635	\$108,010	3.03	3,140
Life Scientists, All Other	535	\$144,269	2.56	-98
Environmental Scientists and Specialists, Including Health	3,237	\$105,509	1.41	-344
Agricultural & Food Science Technicians	1,080	\$45,757	1.47	158
Biological Technicians	3,589	\$60,159	1.63	527
Chemical Technicians	1,708	\$51,883	0.95	87
Environmental Science and Protection Techs, Inc. Health	1,381	\$65,405	1.44	-6
Life, Physical, and Social Science Technicians, All Other	1,675	\$65,287	0.91	52
Medical and Clinical Laboratory Technologists and Technicians	6,373	\$63,544	0.71	511

Source: EMSI, Clower & Assoc.

Bay Area Industry Competitiveness by Location Quotient

(Location Quotients measure industry concentration. A larger location quotient (>1.2) indicates a regional competitive advantage)

Location Quotient for Region by Industry Cluster	2014	2019	2024
BioRenewables	0.37	0.34	0.32
Biopharmaceutical Manufacturing	2.61	2.82	2.80
Medical Devices and Diagnostic Equipment	1.81	1.96	1.91
Life Science Wholesale	0.53	0.56	0.53
Research & Lab Services	1.55	1.72	1.77
All Life Sciences	1.47	1.59	1.61

Source: EMSI, Clower & Assoc.

Bay Area Industry Competitiveness by Shift Share

(The larger the Regional Share compared to Expected Change, the more competitive the industry)

	2014 Jobs	2019 Jobs	% Change	Expected Change	Regional Share
Total - All Industries	3,978,111	4,462,698	12.18%		
BioRenewables	2,200	2,075	-5.70%	-29	-96
Biopharmaceutical Manufacturing	19,058	23,127	21.35%	1,360	2,709
Medical Devices and Diagnostic Equipment	20,172	24,741	22.65%	1,656	2,913
Life Science Wholesale	5,241	7,223	37.81%	1,347	634
Research & Lab Services	70,668	88,024	24.56%	5,505	11,851
All Life Sciences	117,338	145,189	23.73%	9,839	18,011

Source: EMSI, Clower & Assoc.

Economic Impacts (Direct, Indirect, Induced) By Region in Bay Area 2019

Bay Area 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$2,806,393,416	\$1,015,368,858	\$620,279,272	8,966
Biopharmaceutical Manufacturing	\$69,645,810,119	\$45,412,329,567	\$16,017,070,425	116,997
Medical Devices and Diagnostic Equipment	\$20,456,680,949	\$11,547,354,005	\$6,857,388,285	61,395
Life Science Wholesale	\$3,583,497,625	\$2,546,081,220	\$1,421,856,165	14,415
Research & Lab Services	\$42,831,955,495	\$29,583,686,486	\$20,406,473,299	185,981
All Life Sciences	\$139,324,337,604	\$90,104,820,136	\$45,323,067,446	387,753

Source: EMSI, IMPLAN, Clower & Assoc.

Alameda County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$461,901,567	\$140,029,783	\$82,804,103	930
Biopharmaceutical Manufacturing	\$7,103,414,190	\$4,005,211,233	\$1,603,967,860	15,973
Medical Devices and Diagnostic Equipment	\$6,565,748,133	\$3,657,060,946	\$2,148,234,776	21,542
Life Science Wholesale	\$801,408,401	\$547,931,441	\$298,362,205	3,666
Research & Lab Services	\$8,488,676,140	\$5,357,113,760	\$3,632,088,844	45,130
All Life Sciences	\$23,421,148,431	\$13,707,347,163	\$7,765,457,788	87,242

Source: EMSI, IMPLAN, Clower & Assoc.

Contra Costa County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$174,568,042	\$53,437,068	\$32,054,629	501
Biopharmaceutical Manufacturing	\$614,727,846	\$318,421,671	\$159,287,559	1,792
Medical Devices and Diagnostic Equipment	\$785,524,023	\$417,261,094	\$247,725,309	2,713
Life Science Wholesale	\$198,945,176	\$135,859,717	\$72,185,152	910
Research & Lab Services	\$869,518,222	\$535,187,824	\$366,297,246	5,047
All Life Sciences	\$2,643,283,309	\$1,460,167,374	\$877,549,895	10,962

Source: EMSI, IMPLAN, Clower & Assoc.

Marin County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$10,016,101	\$3,610,946	\$2,228,345	43
Biopharmaceutical Manufacturing	\$5,352,476,005	\$3,801,709,749	\$1,477,305,775	8,409
Medical Devices and Diagnostic Equipment	\$27,254,800	\$13,070,686	\$8,102,778	87
Life Science Wholesale	\$61,863,990	\$41,828,672	\$22,975,929	284
Research & Lab Services	\$195,832,262	\$126,732,482	\$90,532,523	1,173
All Life Sciences	5,647,443,158	3,986,952,535	1,601,145,350	9,996

Source: EMSI, IMPLAN, Clower & Assoc.

Napa County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$234,493,383	\$76,576,360	\$43,247,128	1,071
Medical Devices and Diagnostic Equipment	\$35,050,109	\$14,979,687	\$8,755,400	134
Life Science Wholesale	\$11,587,768	\$7,739,603	\$4,031,210	57
Research & Lab Services	\$70,449,667	\$43,618,658	\$31,348,579	587
All Life Sciences	\$351,580,927	\$142,914,308	\$87,382,317	1,849

Source: EMSI, IMPLAN, Clower & Assoc.

San Francisco County 2019

Industry	Output	Value Added	Labor Income	Employment
Biopharmaceutical Manufacturing	\$1,279,953,989	\$1,078,407,905	\$267,115,387	915
Medical Devices and Diagnostic Equipment	\$271,702,178	\$149,087,109	\$88,604,178	809
Life Science Wholesale	\$562,415,400	\$415,591,843	\$234,609,776	2,006
Research & Lab Services	\$5,434,936,697	\$3,831,438,165	\$2,708,560,925	25,410
All Life Sciences	\$7,549,008,264	\$5,474,525,022	\$3,298,890,266	29,140

Source: EMSI, IMPLAN, Clower & Assoc.

San Mateo County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$94,355,208	\$34,754,056	\$30,667,409	478
Biopharmaceutical Manufacturing	\$29,895,463,657	\$19,388,554,604	\$5,466,031,929	35,967
Medical Devices and Diagnostic Equipment	\$1,603,701,245	\$929,984,095	\$553,209,184	4,206
Life Science Wholesale	\$368,775,400	\$264,863,307	\$147,266,679	1,461
Research & Lab Services	\$12,052,646,447	\$8,712,573,393	\$6,053,242,835	41,038
All Life Sciences	\$44,014,941,957	\$29,330,729,455	\$12,250,418,036	83,151

Source: EMSI, IMPLAN, Clower & Assoc.

Santa Clara County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$241,638,202	\$78,506,424	\$50,984,311	845
Biopharmaceutical Manufacturing	\$5,630,213,057	\$3,687,391,223	\$1,427,714,172	8,888
Medical Devices and Diagnostic Equipment	\$7,406,191,716	\$4,087,348,906	\$2,410,706,966	20,045
Life Science Wholesale	\$1,081,409,653	\$819,474,245	\$465,533,768	3,708
Research & Lab Services	\$10,204,996,526	\$7,349,506,046	\$5,214,644,014	42,199
All Life Sciences	\$24,564,449,154	\$16,022,226,844	\$9,569,583,231	75,685

Source: EMSI, IMPLAN, Clower & Assoc.

Solano County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$207,038,694	\$64,196,690	\$39,474,131	776
Biopharmaceutical Manufacturing	\$8,094,023,985	\$4,830,141,569	\$1,049,439,438	9,085
Medical Devices and Diagnostic Equipment	\$147,813,591	\$69,096,169	\$38,393,199	522
Life Science Wholesale	\$123,152,354	\$81,083,019	\$40,481,269	612
Research & Lab Services	\$195,603,460	\$123,005,187	\$92,674,340	1,420
All Life Sciences	\$8,767,632,084	\$5,167,522,634	\$1,260,462,377	12,416

Source: EMSI, IMPLAN, Clower & Assoc.

Sonoma County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$337,446,448	\$120,177,619	\$76,034,280	1,633
Biopharmaceutical Manufacturing	\$280,375,487	\$127,968,207	\$61,993,630	769
Medical Devices and Diagnostic Equipment	\$1,400,616,733	\$794,846,709	\$470,210,560	4,861
Life Science Wholesale	\$73,448,391	\$47,179,316	\$24,369,140	385
Research & Lab Services	\$296,567,756	\$169,153,187	\$119,557,535	2,367
All Life Sciences	\$2,388,454,815	\$1,259,325,038	\$752,165,145	10,016

Source: EMSI, IMPLAN, Clower & Assoc.

Bay Area Foreign Exports of Life Sciences Products and Services 2019

Industry Cluster	Exports
BioRenewables	\$721,981,735
Biopharmaceutical Manufacturing	\$22,941,004,963
Medical Devices and Diagnostic Equipment	\$12,785,791,490
Life Science Wholesale	\$1,823,810,876
Research & Lab Services	\$27,518,271,614
TOTAL LIFE SCIENCE INDUSTRY	\$65,790,860,678

Source: EMSI, Clower & Assoc.

**National Institutes of Health New Research Awards FY2019
Bay Area**

County	Total
Alameda	\$316,885,308
Contra Costa	\$6,556,527
Marin	\$18,125,407
Napa	\$0
San Francisco	\$847,093,032
San Mateo	\$100,158,656
Santa Clara	\$586,807,556
Solano	\$1,214,477
Sonoma	\$994,000
Total	\$1,877,834,963

Sources: NIH (April 2020), Clower & Associates

Southern California

Summary

Southern California includes six counties: Imperial, Los Angeles, Orange, Riverside, San Diego and Ventura Counties. The Southern California Life Sciences industry employed over 242,000 individuals in 2019. The average earnings for these jobs exceeded \$104,000 per year. Job growth by industry cluster between 2014 and 2019 showed substantial variation with strong growth in Medical Devices, Life Sciences Wholesale and Research & Lab Services. There was a small decline over the study period in BioRenewables. Biopharmaceutical Manufacturing took a downward turn with sector employment dropping by almost 4,900 jobs, which may reflect shifts in regional competitive advantages.

Key Life Sciences occupations in Southern California include Biochemists and Biophysicists; Microbiologists; Medical Scientists; and Biological Technicians; however, as pharmaceutical companies have reduced total regional employment, jobs in some of these key occupations is declining. Reflecting sector growth in the Research & Lab Services cluster, the largest occupational job gains were for Medical and Clinical Laboratory Technologists and Technicians. Overall, industry competitive analysis suggests that even though there is growth in Southern California's Life Sciences industries, the region continues a recent trend of losing its competitive advantages over other regions. The most competitive cluster, Medical Devices Manufacturing, did expand its competitive advantage, and the Research & Lab Services cluster is moving towards being the driving sector of the Southern California Life Sciences industry.

Total Life Sciences exports from Southern California totaled more than \$49.3 billion in 2019. The region received \$2.3 billion in new research awards from the National Institutes for Health in FY2019.

The economic impacts of the Life Sciences Industry in Southern California:

- Generates \$160 billion in annual economic activity (output)
- Adds \$86.5 billion to gross regional product
- Creates over 668,000 jobs
- Boosts labor income by \$49.8 billion per year

Southern California Life Sciences Employment

Life Sciences Employment by County	2019	Avg. Earnings
Southern California	242,449	\$104,154
Imperial County	882	\$48,394
Los Angeles County	93,330	\$86,501
Orange County	60,638	\$108,177
Riverside County	10,681	\$77,523
San Diego County	68,063	\$130,411
Ventura County	8,854	\$98,527

Source: EMSI, Clower & Assoc.

Southern California Employment by Life Sciences Cluster

Life Science by Sectors	2014	2019	2024
BioRenewables	7,817	7,396	7,297
Biopharmaceutical Manufacturing	25,663	20,790	20,113
Medical Devices and Diagnostic Equipment	49,403	55,334	57,442
Life Science Wholesale	28,527	33,565	34,661
Research & Lab Services	112,539	125,329	134,856
All Life Sciences	223,949	242,414	254,369

Source: EMSI, Clower & Assoc.

Southern California Life Sciences Industry Establishments by Cluster

Establishments by Sector and County, 2019						
	BioRenewables	Biopharmaceutical Manufacturing	Medical Devices	Life Science Wholesale	Research & Lab Services	All Life Sciences
Southern California	248	358	1,229	2,449	2,688	6,972
Imperial	22	1	2	5	8	37
Los Angeles	50	125	469	1,217	1,029	2,891
Orange	15	82	390	617	489	1,592
Riverside	37	17	64	130	125	372
San Diego	65	119	241	394	932	1,752
Ventura	59	14	63	86	105	325

Source: EMSI, Clower & Assoc.

Wages in Life Sciences Clusters by County

Wages by Sector and County, 2019						
	BioRenewables	Biopharmaceutical Manufacturing	Medical Devices	Life Science Wholesale	Research & Lab Services	All Life Sciences
Southern California	\$46,569	\$113,045	\$120,659	\$118,735	\$90,721	\$104,154
Imperial	\$43,402	Insf. Data	Insf. Data	\$54,636	\$76,375	\$48,394
Los Angeles	\$55,868	\$90,882	\$97,041	\$91,699	\$82,673	\$86,501
Orange	\$52,098	\$94,266	\$124,815	\$129,803	\$75,502	\$108,177
Riverside	\$46,052	\$70,672	\$116,015	\$74,200	\$69,864	\$77,523
San Diego	\$52,158	\$149,676	\$140,984	\$166,903	\$122,915	\$130,411
Ventura	\$43,190	\$111,249	\$112,947	\$224,028	\$69,704	\$98,527

Source: EMSI, Clower & Assoc.

Southern California Employment by Selected Life Sciences Occupations

Title	2019 Jobs	Avg. Annual Wages	Location Quotient	2014-2019 Job Change
Biochemists and Biophysicists	2,235	\$85,640	1.18	-124
Microbiologists	1,168	\$88,835	0.89	-221
Zoologists and Wildlife Biologists	728	\$82,760	0.60	-77
Biological Scientists, All Other	4,872	\$89,392	1.73	1,497
Epidemiologists	289	\$90,008	0.59	58
Medical Scientists	12,376	\$97,229	1.56	2,169
Life Scientists, All Other	645	\$96,812	1.37	-193
Environmental Scientists and Specialists, Including Health	4,759	\$89,183	0.92	-849
Agricultural & Food Science Technicians	1,243	\$44,350	0.75	142
Biological Technicians	5,802	\$51,791	1.16	218
Chemical Technicians	3,231	\$47,342	0.79	-538
Environmental Science and Protection Techs, Inc. Health	2,414	\$60,707	1.12	-264
Life, Physical, and Social Science Technicians, All Other	3,890	\$54,961	0.93	132
Medical and Clinical Laboratory Technologists and Technicians	16,695	\$58,792	0.82	300

Source: EMSI, Clower & Assoc.

Southern California Industry Competitiveness by Location Quotient

(Location Quotients measure industry concentration. A larger location quotient (>1.2) indicates a regional competitive advantage)

Location Quotient for Region by Industry Cluster	2014	2019	2024
BioRenewables	0.57	0.54	0.53
Biopharmaceutical Manufacturing	1.51	1.12	1.05
Medical Devices and Diagnostic Equipment	1.91	1.94	1.95
Life Science Wholesale	1.25	1.15	1.09
Research & Lab Services	1.07	1.08	1.08
All Life Sciences	1.21	1.18	1.16

Source: EMSI, Clower & Assoc.

Southern California Industry Competitiveness by Shift Share

(The larger the Regional Share compared to Expected Change, the more competitive the industry)

	2014 Jobs	2019 Jobs	% Change	Expected Change	Regional Share
Total - All Industries	9,233,736	10,086,089	9.23%		
BioRenewables	7,817	7,396	-5.38%	-105	-316
Biopharmaceutical Manufacturing	25,663	20,790	-18.99%	1,832	-6,704
Medical Devices and Diagnostic Equipment	49,403	55,334	12.01%	4,056	1,875
Life Science Wholesale	28,527	33,565	17.66%	7,334	-2,297
Research & Lab Services	112,539	125,329	11.36%	8,766	4,023
All Life Sciences	223,949	242,414	8.25%	21,844	-3,418

Source: EMSI, Clower & Assoc.

Economic Impacts (Direct, Indirect, Induced) Southern California 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$19,373,837,699	\$7,164,837,505	\$4,183,225,311	69,015
Biopharmaceutical Manufacturing	\$40,529,976,152	\$20,695,348,700	\$9,235,540,508	110,241
Medical Devices and Diagnostic Equipment	\$42,345,577,102	\$22,275,182,328	\$13,020,155,208	158,824
Life Science Wholesale	\$14,880,857,830	\$9,625,332,608	\$5,097,492,012	73,991
Research & Lab Services	\$42,820,584,921	\$26,754,525,243	\$18,291,685,510	256,141
All Life Sciences	\$159,950,833,704	\$86,515,226,384	\$49,828,098,549	668,212

Source: EMSI, IMPLAN, Clower & Assoc.

Southern California Foreign Exports of Life Sciences Products and Services 2019

Industry Cluster	Exports
BioRenewables	\$1,951,241,065
Biopharmaceutical Manufacturing	\$5,324,397,982
Medical Devices and Diagnostic Equipment	\$17,499,002,978
Life Science Wholesale	\$12,120,787,092
Research & Lab Services	\$12,468,046,637
TOTAL LIFE SCIENCE INDUSTRY	\$49,363,475,754

Source: EMSI, Clower & Assoc.

**National Institutes of Health New Research Awards FY2019
Southern California**

County	Total
Los Angeles	\$1,154,270,720
Orange	\$173,910,256
Riverside	\$31,258,811
San Diego	\$1,011,656,214
Ventura	\$1,555,745
Total	\$2,372,651,746

Sources: NIH (April 2020), Clower & Associates

San Diego County

Summary

San Diego County's Life Sciences industry provided more than 68,000 jobs in 2019 with average annual earnings exceeding \$130,000 per year. There was solid job growth in Biopharmaceuticals, Medical Devices and Research & Lab Services support between 2014 and 2019. Total employment in BioRenewables dropped slightly. San Diego County outperformed other counties in Southern California.

Several Life Sciences occupations in San Diego County show high to very high location quotients, which indicates competitive advantage for key industry capabilities. This is led by Biochemist and Biophysicist occupations where the proportion of total jobs in San Diego County is 4.8 times higher than the national average. Tempering this performance measure, however, is that employment in this occupation was essentially flat between 2014 and 2019. Other key occupations include Biological Scientists, Medical Scientists, and Biological Technicians.

San Diego County remains highly competitive in several Life Sciences clusters, with Medical Devices and Diagnostic Equipment Manufacturing being the most competitive using shaft-share analytics. Total Life Sciences exports from San Diego County totaled more than \$24 billion in 2019. San Diego County institutions and companies received over \$1 billion in new research awards from the National Institutes for Health in FY2019.

The economic impacts of the Life Sciences Industry in San Diego County:

- Generates \$41.3 billion in county economic activity (output)
- Adds \$23.8 billion to gross regional product
- Supports 175,000 jobs
- Increases labor income in the county by \$14.1 billion per year

San Diego Life Sciences Employment

Life Sciences Employment by County	2019	Avg. Earnings
San Diego	68,063	\$130,411

Source: EMSI, Clower & Assoc.

San Diego County Employment by Life Sciences Cluster

Life Science by Sectors	2014	2019	2024
BioRenewables	1,604	1,563	1,579
Biopharmaceutical Manufacturing	6,452	7,565	8,118
Medical Devices and Diagnostic Equipment	8,657	11,900	13,089
Life Science Wholesale	3,983	4,623	4,571
Research & Lab Services	37,761	42,412	46,417
All Life Sciences	58,457	68,063	73,774

Source: EMSI, Clower & Assoc.

San Diego Life Sciences Industry Establishments by Cluster, 2019

Industry Cluster	Establishments
BioRenewables	65
Biopharmaceutical Manufacturing	119
Medical Devices and Diagnostic Equipment	241
Life Science Wholesale	394
Research & Lab Services	932
All Life Sciences	1,751

Source: EMSI, Clower & Assoc.

Wages in Life Sciences Clusters

Wages by Sector and County, 2019						
	BioRenewables	Biopharmaceutical Manufacturing	Medical Devices	Life Science Wholesale	Research & Lab Services	All Life Sciences
San Diego County	\$52,158	\$149,676	\$140,984	\$166,903	\$122,915	\$130,411

Source: EMSI, Clower & Assoc.

San Diego County Employment by Selected Life Sciences Occupations

Title	2019 Jobs	Avg. Annual Wages	Location Quotient	2014-2019 Job Change
Biochemists and Biophysicists	1,592	\$82,559	4.81	30
Microbiologists	211	\$103,803	0.92	-48
Zoologists and Wildlife Biologists	139	\$74,829	0.66	-43
Biological Scientists, All Other	2,039	\$86,358	4.14	557
Epidemiologists	65	\$86,896	0.77	12
Medical Scientists	4,382	\$102,068	3.17	748
Life Scientists, All Other	65	\$111,364	0.80	-25
Environmental Scientists and Specialists, Including Health	1,135	\$79,506	1.26	-185
Agricultural & Food Science Technicians	366	\$45,881	1.26	22
Biological Technicians	2,300	\$50,648	2.65	127
Chemical Technicians	829	\$50,086	1.17	-466
Environmental Science and Protection Techs, Inc. Health	562	\$59,386	1.49	-175
Life, Physical, and Social Science Technicians, All Other	943	\$65,050	1.30	-88
Medical and Clinical Laboratory Technologists and Technician	3,974	\$57,778	1.12	115

Source: EMSI, Clower & Assoc.

San Diego County Industry Competitiveness by Location Quotient

(Location Quotients measure industry concentration. A larger location quotient (>1.2) indicates a regional competitive advantage)

Location Quotient for Region by Industry Cluster	2014	2019	2024
BioRenewables	0.68	0.65	0.65
Biopharmaceutical Manufacturing	2.19	2.34	2.43
Medical Devices and Diagnostic Equipment	1.93	2.39	2.54
Life Science Wholesale	1.01	0.91	0.82
Research & Lab Services	2.06	2.10	2.14
All Life Sciences	1.82	1.90	1.93

Source: EMSI, Clower & Assoc.

San Diego County Industry Competitiveness by Shift Share

(The larger the Regional Share compared to Expected Change, the more competitive the industry)

	2014 Jobs	2019 Jobs	% Change	Expected Change	Regional Share
Total - All Industries	1,600,190	1,757,819	9.85%		
BioRenewables	1,604	1,563	-2.53%	-21	-19
Biopharmaceutical Manufacturing	6,452	7,565	17.25%	460	653
Medical Devices and Diagnostic Equipment	8,657	11,900	37.46%	711	2,532
Life Science Wholesale	3,983	4,623	16.06%	1,024	-384
Research & Lab Services	37,761	42,412	12.32%	2,941	1,709
All Life Sciences	58,457	68,063	16.43%	5,115	4,491

Source: EMSI, Clower & Assoc.

Economic Impacts (Direct, Indirect, Induced) San Diego County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$1,162,139,283	\$323,821,276	\$175,992,871	3,887
Biopharmaceutical Manufacturing	\$10,153,000,013	\$5,401,097,856	\$2,425,093,459	29,178
Medical Devices and Diagnostic Equipment	\$9,042,546,420	\$4,727,480,669	\$2,702,859,091	31,974
Life Science Wholesale	\$1,920,306,177	\$1,252,973,701	\$653,436,759	9,679
Research & Lab Services	\$19,070,779,393	\$12,113,585,876	\$8,094,408,790	100,632
All Life Sciences	\$41,348,771,286	\$23,818,959,378	\$14,051,790,970	175,350

Source: EMSI, IMPLAN, Clower & Assoc.

San Diego County Foreign Exports of Life Sciences Products and Services 2019

Industry Cluster	Exports
BioRenewables	\$865,705,121
Biopharmaceutical Manufacturing	\$4,230,228,644
Medical Devices and Diagnostic Equipment	\$5,567,145,371
Life Science Wholesale	\$2,742,670,390
Research & Lab Services	\$10,635,570,261
TOTAL LIFE SCIENCE INDUSTRY	\$24,041,319,787

Source: EMSI, Clower & Assoc.

National Institutes of Health New Research Awards FY2019

County	Total
San Diego	\$1,011,656,214

Sources: NIH (April 2020), Clower & Associates

Orange County

Summary

Orange County had over 60,000 Life Sciences industry jobs in 2019 with annual earnings for these jobs averaging \$108,177 per year. There was solid job growth in Medical Devices Manufacturing, Life Sciences Wholesale and Research and Laboratory Support in Orange County between 2014 and 2019. The Biopharmaceuticals cluster showed a small gain.

The key competitive Life Sciences industry cluster in Orange County is Medical Devices and Diagnostic Equipment Manufacturing with a location quotient of 5.3 in 2019. This means that there are 5.3 times the national average proportion of employees in this industry cluster. Life Science Wholesale Trade is another highly competitive sector based on location quotients, though its relative position against other regions slipped during the study period. The shift share analysis shows that from 2014 through 2019 its major competitive Life Sciences clusters is in Medical Devices and Diagnostics Equipment Manufacturing cluster.

Total Life Sciences exports from Orange County totaled about \$19.6 billion in 2019 driven by \$10.8 billion in Medical Devices and Diagnostic Equipment shipments. Orange County institutions and companies received almost \$174 million in new research awards from the National Institutes for Health in FY2019.

The economic impacts of the Life Sciences Industry in Orange County:

- Generates \$37.2 billion in county economic activity (output)
- Boosts gross county product by \$20.4 billion
- Supports over 147,000 jobs
- Increases labor income in the county by \$11.5 billion per year

Orange County Life Sciences Employment

Life Sciences Employment by County	2019	Avg. Earnings
Orange	60,636	\$108,177

Source: EMSI, Clower & Assoc.

Orange County Employment by Life Sciences Cluster

Life Science by Sectors	2014	2019	2024
BioRenewables	408	374	259
Biopharmaceutical Manufacturing	3,825	4,048	3,546
Medical Devices and Diagnostic Equipment	23,258	27,576	30,221
Life Science Wholesale	8,642	10,206	10,650
Research & Lab Services	16,837	18,432	19,770
All Life Sciences	52,970	60,636	64,446

Source: EMSI, Clower & Assoc.

Orange County Life Sciences Industry Establishments by Cluster, 2019

Industry Cluster	Establishments
BioRenewables	15
Biopharmaceutical Manufacturing	82
Medical Devices and Diagnostic Equipment	390
Life Science Wholesale	617
Research & Lab Services	489
All Life Sciences	1,593

Source: EMSI, Clower & Assoc.

Wages in Life Sciences Clusters

Wages by Sector and County, 2019						
	BioRenewables	Biopharmaceutical Manufacturing	Medical Devices	Life Science Wholesale	Research & Lab Services	All Life Sciences
Orange	\$52,098	\$94,266	\$124,815	\$129,803	\$75,502	\$108,177

Source: EMSI, Clower & Assoc.

Orange County Employment by Selected Life Sciences Occupations

Title	2019 Jobs	Avg. Annual Wages	Location Quotient	2014-2019 Job Change
Biochemists and Biophysicists	164	\$96,247	0.47	-19
Microbiologists	194	\$90,520	0.81	-35
Zoologists and Wildlife Biologists	60	\$85,971	0.27	-15
Biological Scientists, All Other	636	\$91,287	1.24	226
Epidemiologists	42	\$86,313	0.48	7
Medical Scientists	1,845	\$92,568	1.28	177
Life Scientists, All Other	157	\$91,116	1.82	-24
Environmental Scientists and Specialists, Including Health	905	\$87,096	0.96	-94
Agricultural & Food Science Technicians	156	\$41,294	0.51	14
Biological Technicians	702	\$52,989	0.77	-42
Chemical Technicians	657	\$46,366	0.88	38
Environmental Science and Protection Techs, Inc. Health	466	\$58,539	1.18	5
Life, Physical, and Social Science Technicians, All Other	774	\$49,788	1.02	112
Medical and Clinical Laboratory Technologists and Technicians	3,001	\$60,929	0.81	157

Source: EMSI, Clower & Assoc.

Orange County Industry Competitiveness by Location Quotient

(Location Quotients measure industry concentration. A larger location quotient (>1.2) indicates a regional competitive advantage)

Location Quotient for Region by Industry Cluster	2014	2019	2024
BioRenewables	0.17	0.15	0.10
Biopharmaceutical Manufacturing	1.25	1.20	1.01
Medical Devices and Diagnostic Equipment	4.99	5.30	5.61
Life Science Wholesale	2.10	1.91	1.84
Research & Lab Services	0.89	0.87	0.87
All Life Sciences	1.59	1.62	1.61

Source: EMSI, Clower & Assoc.

Orange County Industry Competitiveness by Shift Share

(The larger the Regional Share compared to Expected Change, the more competitive the industry)

	2014 Jobs	2019 Jobs	% Change	Expected Change	Regional Share
Total - All Industries	1,659,725	1,837,633	10.72%		
BioRenewables	408	374	-8.16%	-5	-28
Biopharmaceutical Manufacturing	3,825	4,048	5.84%	273	-49
Medical Devices and Diagnostic Equipment	23,258	27,576	18.57%	1,910	2,409
Life Science Wholesale	8,642	10,206	18.10%	2,222	-657
Research & Lab Services	16,837	18,432	9.47%	1,312	284
All Life Sciences	52,969	60,638	14.48%	5,710	1,958

Source: EMSI, Clower & Assoc.

Economic Impacts (Direct, Indirect, Induced) Orange County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$1,100,735,071	\$280,443,371	\$141,683,477	2,375
Biopharmaceutical Manufacturing	\$8,391,901,066	\$4,023,882,632	\$1,717,589,184	22,049
Medical Devices and Diagnostic Equipment	\$18,354,040,036	\$9,961,516,976	\$5,835,772,146	68,791
Life Science Wholesale	\$4,627,564,063	\$3,141,534,707	\$1,689,135,135	21,887
Research & Lab Services	\$4,724,883,431	\$3,031,611,894	\$2,166,275,187	32,050
All Life Sciences	\$37,199,123,667	\$20,438,989,580	\$11,550,455,129	147,153

Source: EMSI, IMPLAN, Clower & Assoc.

Orange County Foreign Exports of Life Sciences Products and Services 2019

Industry Cluster	Exports
BioRenewables	\$445,729,985
Biopharmaceutical Manufacturing	\$788,296,378
Medical Devices and Diagnostic Equipment	\$10,812,014,963
Life Science Wholesale	\$5,954,498,848
Research & Lab Services	\$1,572,700,222
TOTAL LIFE SCIENCE INDUSTRY	\$19,573,240,396

Source: EMSI, Clower & Assoc.

National Institutes of Health New Research Awards FY2019

County	Total
Orange County	\$ 173,910,256

Sources: NIH (April 2020), Clower & Associates

Los Angeles County

Summary

Los Angeles County is home to over 93,000 Life Sciences industry jobs in 2019 with average annual earnings just over \$86,000. The Research and Laboratory Support cluster recorded the largest growth between 2014 and 2019 along with notable growth in the Life Sciences Wholesale Trade sectors. Pharmaceutical Manufacturing rose slightly, while the industry cluster including Medical Device Manufacturing lost jobs over the study period. The Medical Scientists occupation grew strongly rising about 23 percent from 2014 to 2019.

Even with notable job growth in some clusters, none of the Life Sciences clusters included in our analysis shows strong regional competitiveness using location quotients or shift-share metrics, though Research and Laboratory Support is gaining ground. Nonetheless, Life Sciences exports from Los Angeles County firms reached \$11.6 billion in 2019 and county research and academic institutions won more than \$1.1 billion in new NIH funding in FY2019.

The economic impacts of the Life Sciences Industry in Los Angeles County:

- Generates \$44.2 billion in county economic activity (output)
- Adds \$24.4 billion to gross county product
- Supports almost 196,000 jobs
- Increases labor income by \$14.3 billion per year

Los Angeles County Life Sciences Employment

Life Sciences Employment by County	2019	Avg. Earnings
Los Angeles	93,330	\$86,501

Source: EMSI, Clower & Assoc.

Los Angeles County Employment by Life Sciences Cluster

Life Science by Sectors	2014	2019	2024
BioRenewables	867	694	419
Biopharmaceutical Manufacturing	7,846	7,907	7,799
Medical Devices and Diagnostic Equipment	13,396	12,578	11,500
Life Science Wholesale	12,142	14,427	15,128
Research & Lab Services	52,079	57,724	61,252
All Life Sciences	86,330	93,330	96,098

Source: EMSI, Clower & Assoc.

Life Sciences Industry Establishments by Cluster, 2019

Industry Cluster	Establishments
BioRenewables	50
Biopharmaceutical Manufacturing	125
Medical Devices and Diagnostic Equipment	469
Life Science Wholesale	1,217
Research & Lab Services	1,029
All Life Sciences	2,890

Source: EMSI, Clower & Assoc.

Wages in Life Sciences Clusters by County

Wages by Sector and County, 2019						
	BioRenewables	Biopharmaceutical Manufacturing	Medical Devices	Life Science Wholesale	Research & Lab Services	All Life Sciences
Los Angeles County, California	\$55,868	\$90,882	\$97,041	\$91,699	\$82,673	\$86,501

Source: EMSI, Clower & Assoc.

Los Angeles County Employment by Selected Life Sciences Occupations

Title	2019 Jobs	Avg. Annual Wages	Location Quotient	2014-2019 Job Change
Biochemists and Biophysicists	400	\$93,551	0.41	-23
Microbiologists	478	\$88,860	0.71	-6
Zoologists and Wildlife Biologists	182	\$93,368	0.29	-23
Biological Scientists, All Other	1,924	\$92,264	1.33	669
Epidemiologists	159	\$94,287	0.64	34
Medical Scientists	5,494	\$93,353	1.35	1,250
Life Scientists, All Other	370	\$93,818	1.53	-133
Environmental Scientists and Specialists, Including Health	2,156	\$94,088	0.81	-464
Agricultural & Food Science Technicians	476	\$42,907	0.56	35
Biological Technicians	2,145	\$54,207	0.84	251
Chemical Technicians	1,398	\$45,633	0.67	-34
Environmental Science and Protection Techs, Inc. Health	1,091	\$62,638	0.98	-83
Life, Physical, and Social Science Technicians, All Other	1,884	\$50,977	0.88	96
Medical and Clinical Laboratory Technologists and Technicians	8,433	\$58,058	0.81	-3

Source: EMSI, Clower & Assoc.

Los Angeles County Industry Competitiveness by Location Quotient

(Location Quotients measure industry concentration. A larger location quotient (>1.2) indicates a regional competitive advantage)

Location Quotient for Region by Industry Cluster	2014	2019	2024
BioRenewables	0.12	0.10	0.06
Biopharmaceutical Manufacturing	0.89	0.83	0.80
Medical Devices and Diagnostic Equipment	0.99	0.86	0.76
Life Science Wholesale	1.02	0.96	0.93
Research & Lab Services	0.95	0.97	0.96
All Life Sciences	0.90	0.88	0.86

Source: EMSI, Clower & Assoc.

Los Angeles County Industry Competitiveness by Shift Share

(The larger the Regional Share compared to Expected Change, the more competitive the industry)

	2014 Jobs	2019 Jobs	% Change	Expected Change	Regional Share
Total - All Industries	4,809,991	5,180,777	7.71%		
BioRenewables	867	694	-19.95%	-12	-161
Biopharmaceutical Manufacturing	7,846	7,907	0.78%	560	-499
Medical Devices and Diagnostic Equipment	13,396	12,578	-6.11%	1,100	-1,918
Life Science Wholesale	12,142	14,427	18.82%	3,122	-837
Research & Lab Services	52,079	57,724	10.84%	4,057	1,588
All Life Sciences	86,331	93,330	8.11%	8,827	-1,827

Source: EMSI, Clower & Assoc.

Economic Impacts (Direct, Indirect, Induced) Los Angeles County 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$1,067,875,231	\$258,094,460	\$145,525,765	2,493
Biopharmaceutical Manufacturing	\$14,135,154,161	\$6,556,479,616	\$2,885,443,925	35,727
Medical Devices and Diagnostic Equipment	\$8,092,930,569	\$4,169,801,228	\$2,450,663,852	29,821
Life Science Wholesale	\$5,798,807,034	\$3,764,591,423	\$1,976,984,096	28,771
Research & Lab Services	\$15,111,139,612	\$9,648,325,206	\$6,830,320,866	99,008
All Life Sciences	\$44,205,906,607	\$24,397,291,933	\$14,288,938,504	195,820

Source: EMSI, IMPLAN, Clower & Assoc.

Los Angeles County Foreign Exports of Life Sciences Products and Services 2019

Industry Cluster	Exports
BioRenewables	\$363,338,773
Biopharmaceutical Manufacturing	\$1,236,904,814
Medical Devices and Diagnostic Equipment	\$2,822,894,740
Life Science Wholesale	\$4,015,872,178
Research & Lab Services	\$3,203,734,565
TOTAL LIFE SCIENCE INDUSTRY	\$11,642,745,070

Source: EMSI, Clower & Assoc.

National Institutes of Health New Research Awards FY2019

County	Total
Los Angeles County	\$ 1,154,270,720

Sources: NIH (April 2020), Clower & Associates

City of San Diego

Summary

The City of San Diego's Life Sciences industry provided over 37,400 jobs in 2019 with average annual earnings exceeding \$141,000 per year. There was solid job growth in all industry clusters, except for BioRenewables. The largest job gains between 2014 and 2019 were in Research & Lab Services (+2,822), Medical Devices and Diagnostic Equipment Manufacturing (+960) and Biopharmaceuticals Manufacturing (+614).

Almost all key Life Sciences occupations in the City of San Diego retain strong to exceptionally strong competitive positions based on location quotients analysis. The relative proportion of Biochemists and Biophysicists jobs is 6.6 times the national average, with Medical Scientists and Biological Technicians also being highly represented. The City of San Diego is still competing very well in the major Life Sciences Industry clusters, with the notable exception of Life Sciences Wholesale Trade. Nonetheless, the City of San Diego will continue to be challenged by traditional and emerging regional competitors in other states of Life Sciences Industry investment and growth.

Total Life Sciences exports from the City of San Diego totaled over \$14 billion in 2019. San Diego (City) institutions and companies received \$995.7 million in new research awards from the National Institutes for Health in FY2016, including La Jolla.

The economic impacts of the Life Sciences Industry in the City of San Diego:

- Generates \$19.6 billion in county economic activity (output)
- Adds \$11.7 billion to gross area product
- Supports over 84,000 jobs
- Increases labor income in the county by about \$7.4 billion per year

City of San Diego Life Sciences Employment

Life Sciences Employment	2019	Avg. Earnings
City of San Diego	37,431	\$141,744

Source: EMSI, Clower & Assoc.

City of San Diego Employment by Life Sciences Cluster

Life Science by Sectors	2014	2019	2024
BioRenewables	260	253	256
Biopharmaceutical Manufacturing	3,127	3,741	3,936
Medical Devices and Diagnostic Equipment	3,385	4,345	4,891
Life Science Wholesale	2,472	2,837	2,803
Research & Lab Services	23,433	26,255	29,037
All Life Sciences	32,677	37,431	40,923

Source: EMSI, Clower & Assoc.

City of San Diego Life Sciences Establishments by Cluster*

Life Science by Sectors		2019
BioRenewables		8
Biopharmaceutical Manufacturing		63
Medical Devices and Diagnostic Equipment		80
Life Science Wholesale		147
Research & Lab Services		311
All Life Sciences		609

**From company data list, may not reflect all establishments. Source: EMSI; Clower & Assoc.*

Wages in Life Sciences Clusters

Wages by Sector and County, 2019						
	BioRenewables	Biopharmaceutical Manufacturing	Medical Devices	Life Science Wholesale	Research & Lab Services	All Life Sciences
City of San Diego	\$51,475	\$155,883	\$145,479	\$165,787	\$137,383	\$141,744

Source: EMSI, Clower & Assoc.

City of San Diego Employment by Selected Life Sciences Occupations

Title	2019 Jobs	Avg. Annual Wages	Location Quotient	2014-2019 Job Change
Biochemists and Biophysicists	1,072	\$82,569	6.61	34
Microbiologists	135	\$103,812	1.21	-27
Zoologists and Wildlife Biologists	74	\$74,832	0.71	-32
Biological Scientists, All Other	1,159	\$86,369	4.81	367
Epidemiologists	36	\$86,901	0.87	5
Medical Scientists	2,875	\$102,074	4.25	493
Life Scientists, All Other	37	\$111,366	0.92	-16
Environmental Scientists and Specialists, Including Health	642	\$79,564	1.45	-92
Agricultural & Food Science Technicians	192	\$45,783	1.36	11
Biological Technicians	1,481	\$50,648	3.48	112
Chemical Technicians	472	\$50,086	1.36	-237
Environmental Science and Protection Techs, Inc. Health	305	\$59,456	1.65	-92
Life, Physical, and Social Science Technicians, All Other	554	\$65,109	1.55	-28
Medical and Clinical Laboratory Technologists and Technicians	2,403	\$57,781	1.38	133

Source: EMSI, Clower & Assoc.

City of San Diego Industry Competitiveness by Location Quotient

(Location Quotients measure industry concentration. A larger location quotient (>1.2) indicates a regional competitive advantage)

Location Quotient for Region by Industry Cluster	2014	2019	2024
BioRenewables	0.23	0.22	0.21
Biopharmaceutical Manufacturing	2.18	2.37	2.39
Medical Devices and Diagnostic Equipment	1.55	1.78	1.92
Life Science Wholesale	1.28	1.14	1.02
Research & Lab Services	2.63	2.65	2.71
All Life Sciences	2.09	2.13	2.17

Source: EMSI, Clower & Assoc.

City of San Diego Industry Competitiveness by Shift Share

(The larger the Regional Share compared to Expected Change, the more competitive the industry)

	2014 Jobs	2019 Jobs	% Change	Expected Change	Regional Share
Total - All Industries	778,662	861,114	10.59%		
BioRenewables	260	253	-2.64%	-3	-3
Biopharmaceutical Manufacturing	3,127	3,741	19.65%	223	391
Medical Devices and Diagnostic Equipment	3,385	4,345	28.35%	278	682
Life Science Wholesale	2,472	2,837	14.73%	636	-271
Research & Lab Services	23,433	26,255	12.04%	1,825	997
All Life Sciences	32,677	37,432	14.55%	2,959	1,795

Source: EMSI, Clower & Assoc.

Economic Impacts (Direct, Indirect, Induced) City of San Diego 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$162,613,933	\$40,022,380	\$20,424,677	469
Biopharmaceutical Manufacturing	\$3,696,656,050	\$1,939,645,494	\$954,077,891	10,876
Medical Devices and Diagnostic Equipment	\$3,241,265,532	\$1,681,792,807	\$977,996,811	11,022
Life Science Wholesale	\$1,071,821,025	\$701,556,290	\$367,098,120	5,226
Research & Lab Services	\$11,511,390,893	\$7,314,808,976	\$5,061,595,979	56,686
All Life Sciences	\$19,683,747,433	\$11,677,825,947	\$7,381,193,478	84,278

Source: EMSI, IMPLAN, Clower & Assoc.

City of San Diego Foreign Exports of Life Sciences Products and Services 2019

Industry Cluster	Exports
BioRenewables	\$163,419,354
Biopharmaceutical Manufacturing	\$2,653,533,931
Medical Devices and Diagnostic Equipment	\$1,975,839,634
Life Science Wholesale	\$1,972,445,967
Research & Lab Services	\$7,944,020,361
TOTAL LIFE SCIENCE INDUSTRY	\$14,709,259,247

Source: EMSI, IMPLAN, Clower & Assoc.

National Institutes of Health New Research Awards FY2019

City	Total
San Diego (not including La Jolla)*	\$113,113,419
La Jolla	\$882,600,606
Total City of San Diego	\$995,714,025

* The City of San Diego includes the La Jolla zip codes, which NIH recognizes as a separate area.

Sources: NIH (April 2020), Clower & Associates

City of Los Angeles

Summary

The City of Los Angeles' Life Sciences industry provided over 21,500 jobs in 2019 with average annual earnings of more than \$82,000 per year. There was solid job growth in Life Sciences Wholesale Trade (+452) and Research and Laboratory Support (+1,888) clusters between 2014 and 2019. However, Biopharmaceuticals Manufacturing, Medical Devices and Diagnostic Equipment Manufacturing and the BioRenewables clusters all decreased over the five-year period. Moreover, with the exception of the Research & Lab Services cluster, all of the Life Sciences industry clusters grew less than expected based on national industry trends.

The City of Los Angeles does possess substantial advantages, especially driven by key universities and research institutes. This allows the city to “punch above its weight” in attracting NIH funding, at almost \$886 million in FY2019, and being the region of record for more than \$3.6 billion in foreign exports of Life Sciences products and services. However, in assessing the economic impacts of Life Sciences industry activities in the City of Los Angeles, we observe that the clusters with job gains do not, on a per-job basis, create the economic spillover effects of the sectors that lost jobs over the study period.

The economic impacts of the Life Sciences Industry in the City of Los Angeles:

- Generates \$6.9 billion in economic activity (output)
- Adds \$3.8 billion to local gross product
- Supports over 34,000 jobs
- Increases labor income in the county by about \$2.4 billion per year

City of Los Angeles Life Sciences Employment

Life Sciences Employment	2019	Avg. Earnings
City of Los Angeles	21,508	\$82,399

Source: EMSI, Clower & Assoc.

City of Los Angeles Employment by Life Sciences Cluster

Life Science by Sectors	2014	2019	2024
BioRenewables	230	200	143
Biopharmaceutical Manufacturing	1,469	1,186	1,006
Medical Devices and Diagnostic Equipment	472	436	403
Life Science Wholesale	1,890	2,342	2,496
Research & Lab Services	15,456	17,344	18,520
All Life Sciences	19,517	21,508	22,568

Source: EMSI, Clower & Assoc.

Life Sciences Establishments by Cluster*

Life Science by Sectors		2019
BioRenewables		10
Biopharmaceutical Manufacturing		15
Medical Devices and Diagnostic Equipment		77
Life Science Wholesale		184
Research & Lab Services		213
All Life Sciences		499

* From company data list, may not reflect all establishments. Source: EMSI; Clower & Assoc.

Wages in Life Sciences Clusters

Wages by Sector and County, 2019						
	BioRenewables	Biopharmaceutical Manufacturing	Medical Devices	Life Science Wholesale	Research & Lab Services	All Life Sciences
City of Los Angeles	\$65,039	\$112,526	\$73,548	\$90,391	\$79,682	\$82,399

Source: EMSI, Clower & Assoc.

City of Los Angeles Employment by Selected Life Sciences Occupations

Title	2019 Jobs	Avg. Annual Wages	Location Quotient	2014-2019 Job Change
Biochemists and Biophysicists	65	\$93,516	0.25	-18
Microbiologists	77	\$88,834	0.43	-4
Zoologists and Wildlife Biologists	50	\$93,290	0.30	-4
Biological Scientists, All Other	437	\$92,257	1.14	155
Epidemiologists	37	\$94,273	0.55	8
Medical Scientists	1,193	\$93,275	1.11	254
Life Scientists, All Other	93	\$93,830	1.45	-39
Environmental Scientists and Specialists, Including Health	521	\$94,259	0.74	-109
Agricultural & Food Science Technicians	127	\$42,362	0.56	8
Biological Technicians	467	\$54,206	0.69	57
Chemical Technicians	245	\$45,632	0.44	-21
Environmental Science and Protection Techs, Inc. Health	254	\$62,788	0.86	-19
Life, Physical, and Social Science Technicians, All Other	448	\$50,993	0.79	-21
Medical and Clinical Laboratory Technologists and Technicians	1,841	\$58,033	0.67	21

Source: EMSI, Clower & Assoc.

City of Los Angeles Industry Competitiveness by Location Quotient

(Location Quotients measure industry concentration. A location quotient (>1.2) indicates a regional competitive advantage)

Location Quotient for Region by Industry Cluster	2014	2019	2024
BioRenewables	0.12	0.11	0.08
Biopharmaceutical Manufacturing	0.63	0.47	0.39
Medical Devices and Diagnostic Equipment	0.13	0.11	0.10
Life Science Wholesale	0.60	0.59	0.58
Research & Lab Services	1.07	1.10	1.10
All Life Sciences	0.77	0.77	0.76

Source: EMSI, Clower & Assoc.

City of Los Angeles Industry Competitiveness by Shift Share

(The larger the Regional Share compared to Expected Change, the more competitive the industry)

	2014 Jobs	2019 Jobs	% Change	Expected Change	Regional Share
Total - All Industries	1,265,487	1,371,724	8.39%		
BioRenewables	230	200	-12.88%	-3	-27
Biopharmaceutical Manufacturing	1,469	1,186	-19.27%	105	-388
Medical Devices and Diagnostic Equipment	472	436	-7.63	39	-74
Life Science Wholesale	1,890	2,342	23.95%	486	-33
Research & Lab Services	15,456	17,344	12.22%	1,204	685
All Life Sciences	19,517	21,508	10.21%	1,830	163

Source: EMSI, Clower & Assoc.

Economic Impacts by Cluster (Direct, Indirect, Induced) City of Los Angeles 2019

Industry	Output	Value Added	Labor Income	Employment
BioRenewables	\$662,454,216	\$130,345,615	\$67,816,053	1,020
Biopharmaceutical Manufacturing	\$1,825,345,762	\$817,833,928	\$347,923,263	4,295
Medical Devices and Diagnostic Equipment	\$194,152,080	\$96,757,130	\$60,908,161	792
Life Science Wholesale	\$821,592,255	\$534,988,801	\$277,925,882	3,946
Research & Lab Services	\$3,386,304,753	\$2,208,065,161	\$1,646,279,958	24,218
All Life Sciences	\$6,889,849,066	\$3,787,990,635	\$2,400,853,317	34,270

Source: EMSI, IMPLAN, Clower & Assoc.

City of Los Angeles Foreign Exports of Life Sciences Products and Services 2019

Industry Cluster	Exports
BioRenewables	\$383,216,180
Biopharmaceutical Manufacturing	\$544,198,147
Medical Devices and Diagnostic Equipment	\$92,792,016
Life Science Wholesale	\$1,163,640,071
Research & Lab Services	\$1,425,886,750
TOTAL LIFE SCIENCE INDUSTRY	\$3,609,733,164

Source: EMSI, IMPLAN, Clower & Assoc.

National Institutes of Health New Research Awards FY2019

City	Total
Los Angeles	\$885,652,597

Sources: NIH (April 2020), Clower & Associates

Appendix 1

Defining the Life Science Industry

NAICS Industry Description

INDUSTRIAL BIOTECHNOLOGY AND BIOFUELS

111000	Crop Production (15%)
113210	Forest Nurseries and Gathering of Forest Products (15%)
311221	Wet Corn Milling
311224	Soybean Oilseed Processing
325193	Ethyl Alcohol Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325220	Cellulosic Fiber Manufacturing
325311	Nitrogenous Fertilizer Manufacturing (15%)
325312	Phosphatic Fertilizer Manufacturing (15%)
325314	Fertilizer (Mixing Only) Manufacturing (15%)
325320	Pesticide and Other Agricultural Chemical Manufacturing (15%)

BIOPHARMACEUTICALS

325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing

MEDICAL DEVICES AND DIAGNOSTICS EQUIPMENT

327215	Glass Product Manufacturing Made of Purchased Glass (20%)
333314	Optical Instrument and Lens Manufacturing (10%)
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables (3%)
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
339116	Dental Laboratories

LIFE SCIENCES TRADE

423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
424210	Drugs and Druggists' Sundries Merchant Wholesalers (94%)

RESEARCH AND LAB SERVICES

541380	Testing Laboratories (12%)
541713	Research and Development in Nano-Technology (75%)
541714	Research and Development in Biotechnology
541715	R & D in the Physical, Engineering, and Life Sciences (except Biotechnology) (46%)
611310	Colleges, Universities, and Professional Schools (Private) (25%)
621511	Medical Laboratories
902612	Colleges, Universities, Professional Schools (State Government) (25%)
903612	Colleges, Universities, Professional Schools (Local Government) (10%)

Appendix 2

Data in this Appendix shows degrees awarded in Academic Year 2018 in Biotech related fields by Institution. There are 75 programs (by CIP code) included in Biotech related fields as shown below. For brevity, we have only shown those institutions with at least 20 total graduates in the designated programs.

Code	Description	Code	Description	Code	Description
14.0501	Bioengineering and Biomedical Engineering	26.0503	Medical Microbiology and Bacteriology	26.0912	Aerospace Physiology and Medicine
26.0101	Biology/Biological Sciences, General	26.0504	Virology	26.0999	Physiology, Pathology, and Related
26.0102	Biomedical Sciences, General	26.0505	Parasitology	26.1001	Pharmacology
26.0202	Biochemistry	26.0506	Mycology	26.1002	Molecular Pharmacology
26.0203	Biophysics	26.0507	Immunology	26.1003	Neuropharmacology
26.0204	Molecular Biology	26.0508	Microbiology and Immunology	26.1004	Toxicology
26.0205	Molecular Biochemistry	26.0599	Microbiological Sciences and Immunology	26.1005	Molecular Toxicology
26.0206	Molecular Biophysics	26.0801	Genetics, General	26.1006	Environmental Toxicology
26.0207	Structural Biology	26.0802	Molecular Genetics	26.1007	Pharmacology and Toxicology
26.0208	Photobiology	26.0803	Microbial and Eukaryotic Genetics	26.1099	Pharmacology and Toxicology, Other
26.0209	Radiation Biology/Radiobiology	26.0804	Animal Genetics	26.1101	Biometry/Biometrics
26.0210	Biochemistry and Molecular Biology	26.0805	Plant Genetics	26.1102	Biostatistics
26.0299	Biochemistry, Biophysics, Molecular Biology	26.0806	Human/Medical Genetics	26.1103	Bioinformatics
26.0301	Botany/Plant Biology	26.0807	Genome Sciences/Genomics	26.1104	Computational Biology
26.0305	Plant Pathology/Phytopathology	26.0899	Genetics, Other	26.1199	Biomathematics, Bioinformatics
26.0307	Plant Physiology	26.0901	Physiology, General	26.1201	Biotechnology
26.0308	Plant Molecular Biology	26.0902	Molecular Physiology	26.1308	Systematic Biology
26.0399	Botany/Plant Biology, Other	26.0903	Cell Physiology	26.1309	Epidemiology
26.0401	Cell/Cellular Biology and Histology	26.0904	Endocrinology	26.1401	Molecular Medicine
26.0403	Anatomy	26.0905	Reproductive Biology	26.1501	Neuroscience
26.0404	Developmental Biology and Embryology	26.0907	Cardiovascular Science	26.1502	Neuroanatomy
26.0406	Cell/Cellular and Molecular Biology	26.0908	Exercise Physiology	26.1503	Neurobiology and Anatomy
26.0407	Cell Biology and Anatomy	26.0909	Vision Science/Physiological Optics	26.1504	Neurobiology and Behavior
26.0499	Cell/Cellular Biology and Anatomical Sciences	26.0910	Pathology/Experimental Pathology	26.1599	Neurobiology and Neurosciences
26.0502	Microbiology, General	26.0911	Oncology and Cancer Biology	26.9999	Biological and Biomedical Sciences

Biotech Related Degrees Awarded at California Institutions—AY2018

Institution	Associate's	Bachelor's	Master's	Doctor's
University of California-San Diego	0	1,616	250	111
University of California-Los Angeles	0	1,392	77	134
University of California-Davis	0	1,437	28	113
University of California-Berkeley	0	962	121	140
University of California-Riverside	0	851	37	64
University of California-Irvine	0	717	70	57
University of California-Santa Cruz	0	645	8	13
University of California-Santa Barbara	0	518	17	9
University of Southern California	0	297	168	76
San Francisco State University	0	393	57	0
San Diego State University	0	313	60	3
California Polytechnic State University-San Luis Obispo	0	345	30	0
University of California-Merced	0	359	3	8
California State University-Northridge	0	313	30	0
California State University-Fullerton	0	302	23	0
Stanford University	0	95	79	125
California State Polytechnic University-Pomona	0	265	25	0
California State University-Long Beach	0	239	38	0
California State University-Sacramento	0	255	19	0
San Jose State University	0	184	41	0
California State University-Los Angeles	0	237	26	0
California State University-East Bay	0	224	22	0
Humboldt State University	0	210	11	0
California State University-San Marcos	0	173	25	0
University of San Diego	0	178	0	0
California State University-Fresno	0	153	13	0
Santa Clara University	0	148	16	0
California State University-Channel Islands	0	137	18	0
Clovis Community College	154	0	0	0
Bakersfield College	154	0	0	0
Reedley College	146	0	0	0
San Diego Miramar College	143	0	0	0
University of the Pacific	0	123	19	0
California State University-Chico	0	128	7	0
California State University-Monterey Bay	0	132	0	0

Institution	Associate's	Bachelor's	Master's	Doctor's
California State University-San Bernardino	0	119	6	0
California State University-Bakersfield	0	118	6	0
Sonoma State University	0	108	12	0
University of California-San Francisco	0	0	24	95
Fresno City College	111	0	0	0
Long Beach City College	103	0	0	0
Sierra College	103	0	0	0
California State University-Stanislaus	0	95	0	0
San Diego Mesa College	93	0	0	0
Loyola Marymount University	0	79	14	0
Orange Coast College	92	0	0	0
Diablo Valley College	91	0	0	0
California Baptist University	0	90	0	0
San Diego City College	86	0	0	0
California State University-Dominguez Hills	0	80	4	0
University of San Francisco	0	64	16	0
Mission College	79	0	0	0
Chabot College	70	0	0	0
Occidental College	0	64	0	0
Pomona College	0	64	0	0
Antelope Valley College	63	0	0	0
University of La Verne	0	59	0	0
Las Positas College	58	0	0	0
California Lutheran University	0	58	0	0
California Institute of Technology	0	23	7	27
Sacramento City College	55	0	0	0
Biola University	0	54	0	0
Chapman University	0	53	0	0
Scripps College	0	51	0	0
University of Redlands	0	51	0	0
La Sierra University	0	48	1	0
Loma Linda University	0	0	31	16
Point Loma Nazarene University	0	40	7	0
National University	35	11	0	0
Fullerton College	40	0	0	0
Los Medanos College	39	0	0	0
Notre Dame de Namur University	0	39	0	0
Saint Mary's College of California	0	39	0	0
Cosumnes River College	39	0	0	0
Cuyamaca College	39	0	0	0
Laney College	38	0	0	0

Institution	Associate's	Bachelor's	Master's	Doctor's
Citrus College	38	0	0	0
Los Angeles Valley College	37	0	0	0
Dominican University of California	0	31	6	0
Whittier College	0	36	0	0
Moorpark College	36	0	0	0
Claremont McKenna College	0	34	0	0
Taft College	34	0	0	0
Azusa Pacific University	0	33	0	0
El Camino Community College District	32	0	0	0
Westmont College	0	31	0	0
Folsom Lake College	30	0	0	0
Chaffey College	29	0	0	0
Pacific Union College	0	29	0	0
Pepperdine University	0	29	0	0
Foothill College	28	0	0	0
Mount Saint Mary's University	0	28	0	0
Charles R Drew University of Medicine and Science	0	8	19	0
De Anza College	26	0	0	0
Santiago Canyon College	25	0	0	0
Fresno Pacific University	0	24	0	0
Cerritos College	24	0	0	0
Concordia University-Irvine	0	23	0	0
Santa Barbara City College	23	0	0	0
Cabrillo College	22	0	0	0
Hartnell College	21	0	0	0
Mills College	0	20	0	0

Source: Integrated Post-Secondary Education Data System aggregated by EMSI

Appendix 3

Unique Company Count Data

The data recorded below provides “unique” company counts in the most innovative sectors of the Life Sciences industry. In previous sections, we report the number of establishments by region/ county/ cluster. As noted in the data description, establishments are unique locations for a given enterprise. A company with multiple locations will show multiple establishments. This is because state and federal workforce agencies require reporting by location. However, this means that the number of establishments may inflate the number of actual companies located in a given geographic area. In the tables below, we use data from Database USA, which is aggregated by EMSI, to show the number of unique companies in selected Life Sciences industries. The industries selected do not align exactly with the cluster definitions shown in Appendix 1, except for Biopharmaceutical Manufacturing. Because of these differences, and because the underlying data sources are different, it is not appropriate to compare specific establishment counts as presented in this Data Book with the Unique Company Counts presented below. Finally, in identifying companies with multiple locations within a given geography, we rely on the Business Name identified by Database USA and do not count entities where there is an exact name match. It is possible that some Business Names may show a variation that results in counting the same company twice. In addition, the Business Name may not accurately reflect business ownership, such as when two firms merge, but keep using separate names.

Industries included in the Unique Company Counts

NAICS	Industry Description
INDUSTRIAL BIOTECHNOLOGY AND BIOFUELS	
311224	Soybean Oilseed Processing
325193	Ethyl Alcohol Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325220	Cellulosic Fiber Manufacturing
BIOPHARMACEUTICALS	
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
MEDICAL DEVICES AND DIAGNOSTICS EQUIPMENT	
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
RESEARCH AND LAB SERVICES	
541713	Research and Development in Nano-Technology
541714	Research and Development in Biotechnology
541715	R & D in the Physical, Engineering, and Life Sciences (except Biotechnology)
621511	Medical Laboratories

Unique Company Counts

Selected Life Sciences Industries by Modified Cluster

Number of Companies 2020					
	Bio-Renewables	Bio-Pharmaceutical Manufacturing	Medical Devices	Research & Lab Services	Totals
Bay Area	8	151	138	1,189	1,486
Alameda County	3	39	47	304	393
Contra Costa County			12	90	102
Marin County		5	3	65	73
Napa County	1	1	2	14	18
San Francisco County		23	7	131	161
San Mateo County	1	39	19	180	239
Santa Clara County	3	36	40	313	392
Solano County		2	3	43	48
Sonoma County		6	5	49	60
Southern California	10	264	229	2,149	2,652
Imperial County				11	11
Los Angeles County	3	116	96	852	1,067
Orange County	3	31	47	335	416
Riverside County		9	12	74	95
San Diego County	4	96	68	792	960
Ventura County		12	6	85	103
City of Los Angeles	1	15	12	106	134
City of San Diego	3	63	37	297	400

Source: EMSI, Clower & Assoc.