



Annual Report 2016

North Bay Life Science Alliance

April 30, 2016

Prepared by Marin Economic Forum

Highlights

Summary of Key Findings

The North Bay Life Science Alliance (NBLSA) monitors trends in employment, financing, commercial space, and government support for life-science businesses in Marin, Napa, Solano, and Sonoma counties. Consequentially, the North Bay is connected and important to the greater Bay Area, one of the global hubs of life-science businesses and finance.

While this report identifies 90 businesses involved in global life-science markets within the NBLSA counties, there may be as many as 470 headquartered and branch businesses stretching across different life-science sectors in the North Bay. There has been both growth of life science jobs and geographic movement. As of the second quarter of 2015, the NBLSA counties accounted for 10,000 jobs in life-science jobs. For the entire year 2015, researchers were awarded \$13 million in National Institute of Health (NIH) grant, primarily from the Buck Institute for Aging Research in Marin County. Venture capital trends are moving toward a larger proportion of life-science investment in portfolios; in Marin County, biotechnology is second only to software as venture capital investment since 2009.

Highly-educated dominate these fields; most workers are 25 years and older. In Marin County more than 54 percent of the resident population is over 25 years of age and has at least a bachelor's degree; Marin County has a similar proportion of bachelor's degrees or higher to San Francisco County (54.8 percent in Marin County to 52.9 in San Francisco). In the NBLSA counties, most life science workers have at least a bachelor's degree or higher, matching the local demography well. Wages in life-science businesses are generally higher than average wages in these counties, ranging from \$18/hour for technicians to six-figure salaries for medical researchers, business management and sales. Marin and San Mateo counties have the highest, life-science wages in California. Annually, the impact of the life science industries grows in these communities as the number of employees increase along with the amount of businesses connecting along supply chains and value chains locally.

Since 2010, a relative abundance of commercial space has slowly disappeared as vacancy rates have fallen. Pricing remains competitive in terms of the greater Bay Area. Flex lab and research space remained in short supply as 2016 unfolded. Housing markets have tracked employment in life-science jobs, a correlation that suggests the breadth of effects on the local economy as these businesses grow. In the NBLSA counties, due to the capture of leakages and use of regional workers, approximately \$49 million of business revenue is generated for the regional economy, including businesses outside of life science, for every 100 new workers in a bioscience business.

The North Bay counties are positioned and poised to see more new businesses and to increasingly become a locality where more life science employees and scientists can find jobs. As a result, the four counties that comprise the NBLSA have declared life science as an economic development target, and are actively pursuing new and expanding businesses to this area.

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Life Science Industry Characteristics, Economic Impacts, and Possibilities

The North Bay's four counties (Marin, Napa, Solano, and Sonoma) have become a continually growing hub of life-science firms and activities. The life-science industry is an umbrella over a large number of industries as well as a mix of multinational corporations and their branch offices and facilities. Additionally, the field encourages the existence of lone biology researchers attempting to find the next significant cure. The California Life Science Association (CLSA at www.clsa.org), a trade association for life-science businesses headquartered in South San Francisco, generally describes the life-science industry sectors as a mix of the following businesses:

- Biomaterials and Bioprocesses;
- Medical Therapeutics;
- Agricultural Biotechnology;
- Animal health and nutrition, and
- Nutraceuticals.

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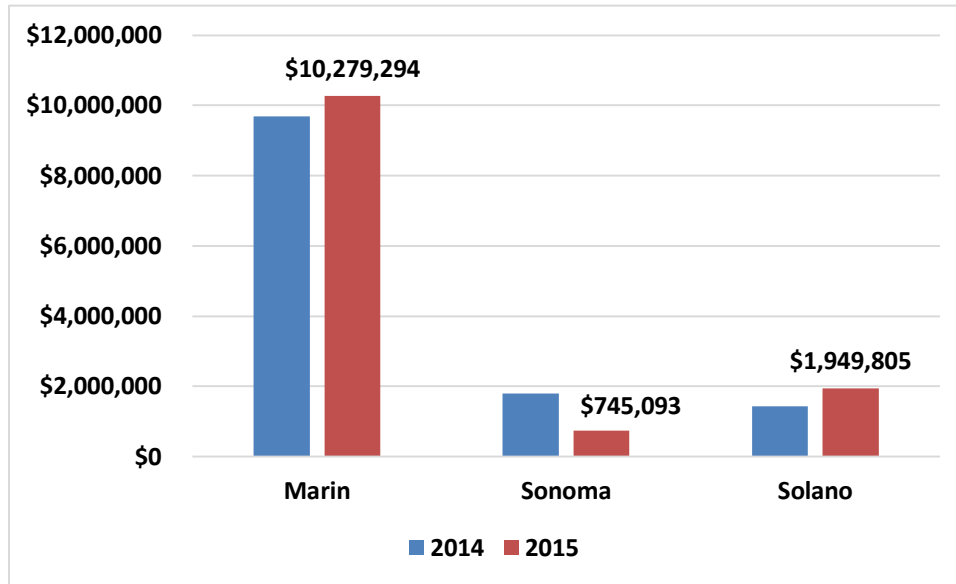
Broader Trends

Like other technology and scientific industries, life-science businesses connect labor, finance and global market opportunities. Economic recovery in the United States has coincided with an expansion of businesses and workers in these industries. Typically, an investment pattern starts with funded research on new or expanded science and patents (normally through governmental and non-profit foundation grant funding), leading to venture capital or equity-market financing for commercial science applications.

Funding

Since 2005, NBSA counties have generated \$10- \$15 million annually in National Institute of Health (NIH) grant-funding, most of which goes to researchers at the Buck Institute for Aging Research. The federal fiscal years 2013-14 and 2014-15 data is in Figure 1. UC Davis, a major research university at Solano County's eastern border, generates approximately \$190 million per year in NIH funding.

Figure 1: NIH Funding in NBLSA Counties, 2014 and 2015 Fiscal Years



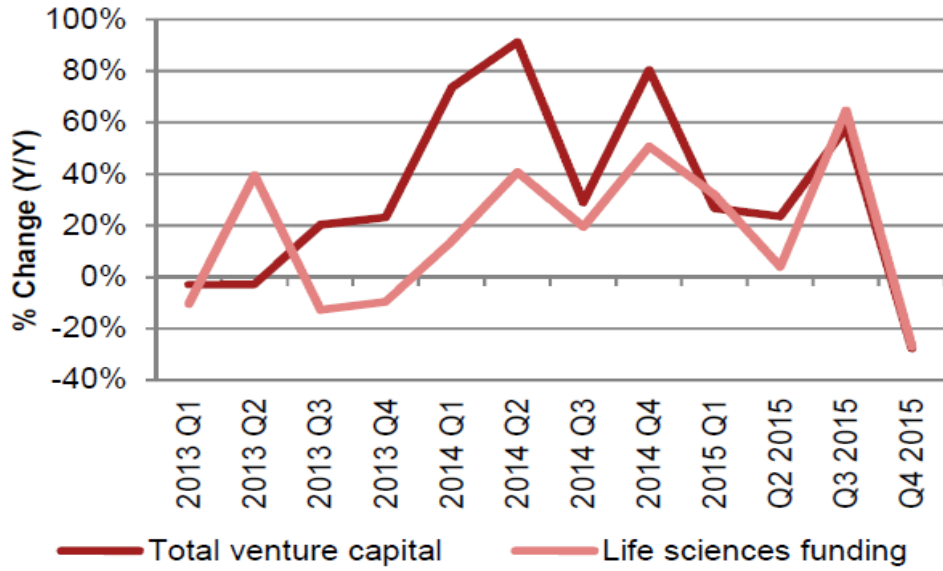
Source: National Institute for Health (grants.nih.gov)

Grant funding can generate interest from venture capitalists. These grants help venture funds to share risk with governmental agencies as the research is becoming commercialized. Price Waterhouse Cooper (PWC) reported that over \$2 billion was invested in US-based life-science firms in the fourth quarter of 2015. Figure 2 shows that venture deals fell in Q4 2015 after relatively robust growth since mid-2014. Venture capital funding for life science grew to just over 18 percent of the US market total as of 2015 Q4 (the latest data available). Biotechnology represents over 71 percent of these deals, and medical devices represent the other 29 percent. Most of the funding in medical device technology is late-stage (beyond clinical trials or already in the market); biotechnology venture deals are more in early-stage (research is going through or toward the end of clinical trials). This is important NBLSA information for two reasons:

- Companies in the North Bay are predominantly biotech or medical device firms and
- The Bay Area is the largest region in the United States experiencing venture deals.

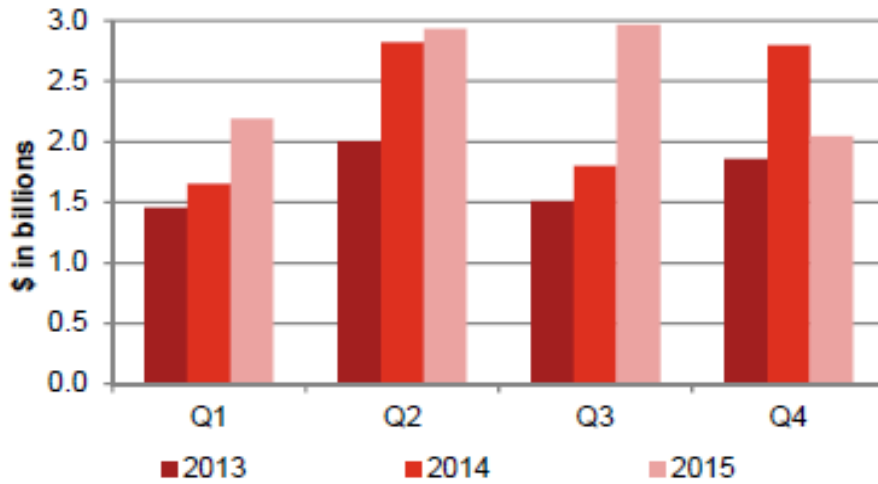
Figure 2 also shows recent trends in the life science industry and Figure 3 shows the changes in Marin County as an example of the mix of venture capital in the NBLSA. Figure 4 shows the types of venture capital deals made in Marin County specifically. (Note: biotechnology is second to software since 2009.)

Figure 2: National Trends in Venture Capital Funding, Total and Life Science, % Change



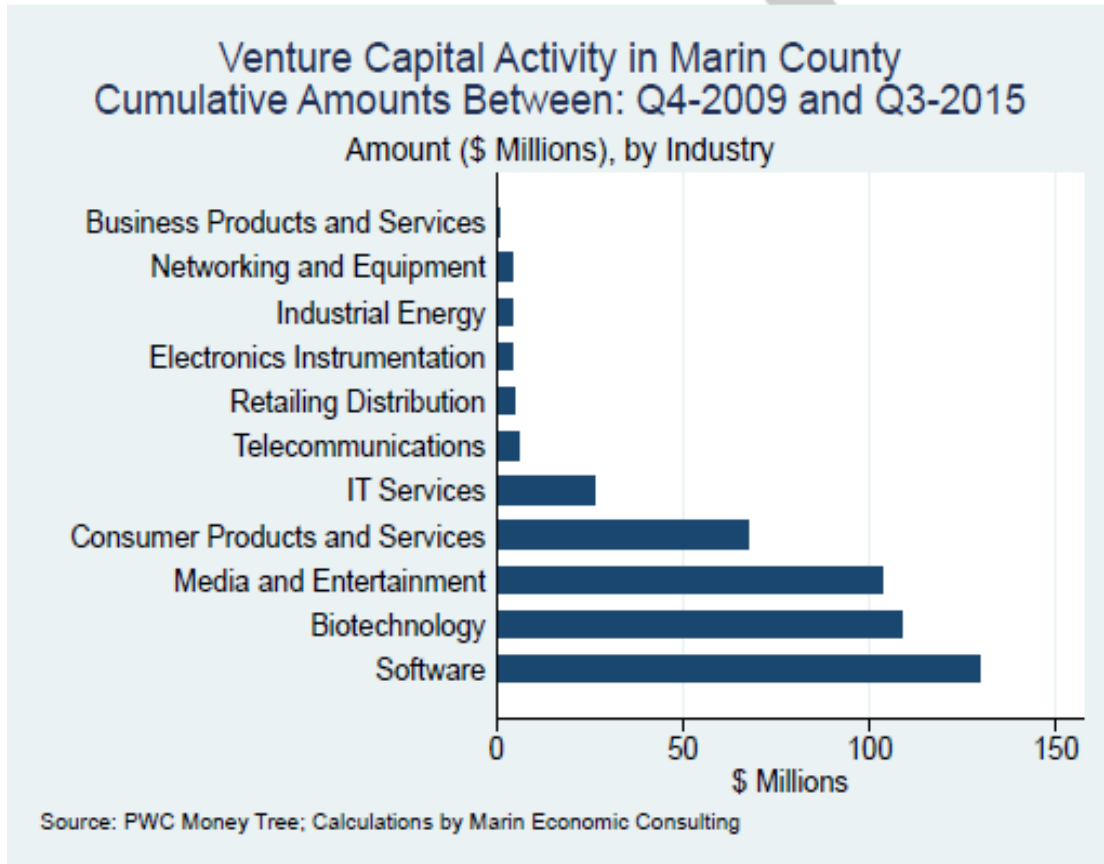
Source: PWC Life Sciences Venture Funding Trends, 2015 Q4

Figure 3: Life Science Trends by Quarter, US Venture Capital Market, Billions \$



Source: PWC Life Sciences Venture Funding Trends, 2015 Q4

Figure 4: Venture capital summary, 2009 Q4 to 2015 Q3
Venture Capital Sub-industries



Thinking Globally and Regionally

A recent report by Deloitte LLP provides global opportunities and concerns in 2016.¹ Growth of spending in pharmaceuticals is suggested to be tied to global health care spending and is predicted to grow at 4.3 percent per year from 2016 to 2019 and reach a total of \$1.4 trillion in 2019 for global pharmaceutical sales. By 2019, biotech is estimated to grow from 18 percent of pharmaceutical sales to 26 percent worldwide, mainly in vaccines and biologics (genetically-engineered proteins derived from human genes). This would be a total of \$445 billion in sales revenue for biotech with China, Russia, Brazil and the United States being the major markets.

Medical technology and devices is predicted to grow 4.1 percent annually to \$454 billion for worldwide sales revenues by 2019. In-vitro diagnostics is considered this industry segments largest product category, estimated by Deloitte to be 14 percent of the global med tech market. In 2015

¹ See <http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-2016-life-sciences-outlook.pdf> for more.

Medtronic, a business with a major division located in Sonoma County, became larger than long-time industry leader Johnson and Johnson in terms of medical technology and device sales. Mergers and acquisitions, including the Covidien acquisition by Medtronic, is likely how companies will continue to grow versus venture funding through 2020. Bioinformatics and biosensors are drawing more venture capital likely due to its potential tie to mobile technologies and the future of such companies. The Deloitte report also identified major issues for life-science businesses, including:

- **Economic uncertainty:** economic weakness in China, Russia and Brazil have investors nervous;
- **Changing demographics:** an aging population and chronic disease suggest more health-care system challenges and spending implications in that segment;
- **Accessibility and affordability:** trends toward universal health care, such as the Affordable Care Act in the U.S., may increase overall spending on health care by governments;
- **Taxation:** need for more tax management and consideration of rules for global revenue generation and transparency is rising.

As local life-science firms grow their employment and revenues, the NBSLA counties must consider how to support new and expanding businesses in the face of competition from other regions and utilization of commercial real estate.

Commercial Space

The Bay Area

In 2015 demand for commercial space increased while vacancy rates fell quickly for flex-lab space, commercial real estate that can flex between office, industrial and laboratory uses. The vacancy rate for this mix of office and lab spaces in San Mateo County is estimated at 5.1 percent and may be as low as 0.2 percent in San Francisco. One solution has been to sublease space where possible (the Buck Institute in Novato does that now, almost like an incubator), including equipment use and leasing. The East Bay also saw some expansion in 2015 also and vacancies are down to around 5 percent. The East Bay is a good model for the North Bay, having taken advantage of rising prices in San Francisco and San Mateo counties to create a proximate alternative. Pricing on leasing space is closer to \$36 per square foot in the East Bay compared to \$38/sq ft in San Francisco as of January 2016.² The North Bay had both acquisition activity and vacancy rates fall during 2015

Marin County

BioMarin (www.bmrn.com) is the largest commercial real estate story of 2015 for the NBSLA counties. BioMarin's purchase of the San Rafael Corporate Center in 2015 reinforced Marin County's importance as a location to operate (see Table 1). This property is approximately 315,000 square feet

² These data are from Newmark Cornish Carey.

as a mix of offices and potential research and development space. Another 700,000 square feet of space now exists in Marin County comprised of the former Fireman’s Fund/Allianz Insurance building in northern Novato. This space became available in early 2016. Industrial space in Marin County has low vacancy, due both to a lack of overall supply and new building (3.3 percent vacancy as of Q4 2015).³ Office vacancy is approximately 17 percent. Property sales were the big story in Marin County for 2015. Table 1 provides some examples.

Table 1: Properties Sold in Marin County in 2015

Location	Sales Price	Sq Ft	\$/sq ft
Hamilton Landing, Novato	\$82,000,000	410,000 sf	\$200 psf
88 & 75 Rowland, Novato	\$25,000,000	143,444 sf	\$174 psf
7250 Redwood Blvd., Novato	\$16,250,000	87,000 sf	\$186 psf
Larkspur Landing, Larkspur	\$82,000,000	199,046 sf	\$412 psf
5725 Paradise Dr., Corte Madera	\$51,000,000	97,410 sf	\$523 psf
4040 Civic Center, San Rafael	\$34,900,000	130,237 sf	\$267 psf
4000 Civic Center, San Rafael	Not Available	142,364 sf	
Drakes Bay Office Park	Not Available	130,177 sf	
899 North Gate, San Rafael	\$13,500,000	55,000 sf	\$245 psf
16450 Los Gamos, San Rafael	\$22,000,000	148,000 sf	\$149 psf
San Rafael Corporate Ctr. (Bio Marin)	\$116,000,000	314,788 sf	\$368 psf

Source: Keegan and Coppin Commercial (www.keegancoppin.com)

Sonoma County

Sonoma County has a medical device research, development and manufacturing cluster, anchored by Medtronic and Trivascular, primarily in the Airport Corridor of northern Santa Rosa. While Petaluma is a potential growth area for the life science industry, space is very limited in and most deals in 2015 were in spaces of less than 10,000 square feet. Vacancy rates are down to 4 percent as of 2016 and office space remains around 15 percent vacancy; prices are rising but remain under \$2.25 per square foot for Class A office. Concurrently, new apartment construction is allowing Petaluma to grow its population and potential, local workforce with limited commuting.

Rohnert Park has two spaces that may work for life science, especially with Sonoma State University two miles from the city center. A former State Farm Insurance complex is now vacant, with over 42,000 square feet of space. Another property on the same street (State Farm Drive) has over

³ Source materials for this section are from [Keegan and Coppin](#), [Newmark Cornish Carey](#), and [Cushman Wakefield](#).

23,000 square feet. While Rohnert Park's commercial real estate supply is mainly office space, and not industrial (vacancy for office space is closer to 30 percent, while industrial space is limited and closer to 7.5 percent), life-science research and development could expand in Rohnert Park.

Santa Rosa now has gigabit Internet in the Airport Corridor, making it a desirable research and development expansion area. Craft brewing, as with other industrial space in Sonoma County, is becoming a direct competitor to potential R&D and lab space. The office space vacancy rate near the airport is just over 10 percent while the industrial vacancy rate is down to 2.5 percent. Most of the major acquisitions in 2015 were either retail or health-care related.

Solano County

Solano County has the largest number of life-science employees in the NBLSA's four counties. The Genentech campus in northeast Solano County, just outside Vacaville on the 505 corridor, is a comprehensive bioscience campus and relatively close to UC Davis. Solano County has an office vacancy rate of 18 percent as of Q4 2015, according to Colliers International. Rents are relatively low, at \$2.10 per square foot for class A space. Fairfield saw life-science activity in Q4 2015 with Zimmer Biomet Fagain leasing 6,000 sq ft of Class B office space.

The industrial space inventory in Solano County is approximately 340,000 square feet vacant as of Q4 2015. Tiny Benicia has approximately 160,000 square feet of industrial space available in the R&D flex category as 2016 begins. Presently, Solano County hassles construction but also has multiple economic efforts underway for currently underdeveloped commercial sites, some of which may be suitable for life science work. More than 200,000 feet of industrial space was leased in Q4 2015 to logistics and solar businesses in Benicia. About 100,000 square feet were leased in Fairfield in Q4 2015, most of which was warehousing for food manufacturing and general logistics. Vacaville's small amount of industrial space was continued to be eaten up by ICON aircraft and warehousing and logistics businesses in 2015, over 600,000 square feet in Q4 2015.

Napa County

Napa County remains a place for the wine industry's supply chain, and the 2015 commercial real estate market continues to be a warehousing and retail marketplace. The former Dey Pharmaceutical facility near the Napa County Airport (2751 Napa Valley Corporate Drive) has 78,000 square feet of flex-lab space, specifically designed for pharmaceutical research and manufacturing. Napa County may be a place for logistics, but competes directly with the wine industry for those spaces. Industrial vacancy was approximately 10 percent at the beginning of 2016. Napa County has an office space vacancy rate is 8.3 percent as of January 2016. The 2014 earthquake, while still visible in the downtown city of Napa, had little lasting effect on the community's economics. Industrial and warehouse space was very tight heading as of January 2016, with both rates at approximately four percent vacancy. American Canyon has virtually no industrial, warehousing or R&D flex vacancy.

Summary

Commercial real estate for life-science businesses ranges from office to industrial to flex lab. Depending on the type of business and what part of the industry value and supply chain a business is, the North Bay had moderate availability of space available as 2016 unfolded. These are competitive on pricing with the core Bay Area counties. These counties house employees also; there has been a correlation between housing prices and hiring by life-science employers since 2010. These issues and more are discussed further in the next section.

Data and Comparisons

Employment

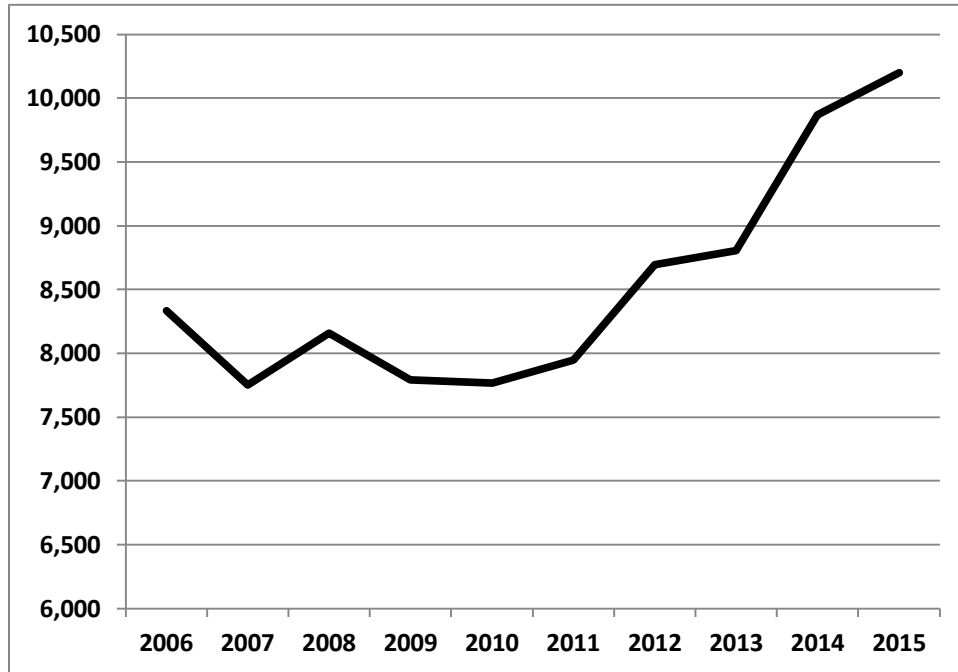
In the second quarter of 2015 (the latest data available), there were approximately 110,000 Bay Area workers in life science as defined in this report (see Table 2 for industries that define life-science businesses). Figure 5 shows the change in the number of life-science workers in the NBLSA's four counties. Since 2010, the 30 percent expansion is among the fastest growing industries in these four counties overall. It represents a combination of rapid growth and also a focus on economic development in these industries. A recent economic impact report by the CSLA, based NAICS codes in Table 2 proportions life science businesses with a certain number of jobs in each code.

Table 2: NAICS Codes used to Define Life-Science Industries, CLSA, 2015

NAICS Code	Description	Sector	% Applied
61131	Colleges and Universities	Academic Research	0.14
325411	Medicinal and Botanical Mfg.	Biopharmaceuticals	1
325412	Pharmaceutical Preparation Mfg.	Biopharmaceuticals	1
325413	In-Vitro Diagnostic Substance Mfg.	Biopharmaceuticals	1
325414	Biological Product (except Diagnostic) Mfg.	Biopharmaceuticals	1
325193	Ethyl Alcohol Mfg.	Biorenewables	1
325199	All Other Basic Organic Chemical Mfg.	Biorenewables	1
325311	Nitrogenous Fertilizer Mfg.	Biorenewables	1
325312	Phosphate Fertilizer Mfg.	Biorenewables	1
325314	Fertilizer (Mixing Only) Mfg.	Biorenewables	1
32532	Pesticide and Other Agricultural Chemical Mfg.	Biorenewables	1
334510	Electro medical and Electrotherapeutic Apparatus Mfg.	Med Devices and Diagnostics	1
334516	Analytical Laboratory Instrument Mfg.	Med Devices and Diagnostics	1
334517	Irradiation Apparatus Mfg.	Med Devices and Diagnostics	1
339112	Surgical and Medical Instrument Mfg.	Med Devices and Diagnostics	1
339113	Surgical Appliance and Supplies Mfg.	Med Devices and Diagnostics	1
339114	Dental Equipment and Supplies Mfg.	Med Devices and Diagnostics	1
339115	Ophthalmic Goods Mfg.	Med Devices and Diagnostics	1
339116	Dental Laboratories	Med Devices and Diagnostics	1
54138	Testing Laboratories	Research, Testing, & Medical Labs	0.19
541711	Research and Development in Biotechnology	Research, Testing, & Medical Labs	1
541712	R&D in the Physical, Engineering, & Life Sciences (except Biotechnology)	Research, Testing, & Medical Labs	0.12
62151	Medical Laboratories	Research, Testing, & Medical Labs	1
42345	Medical, Dental, & Hospital Equipment & Supplies Merchant Wholesalers	Wholesale Trade	1
42346	Ophthalmic Goods Merchant Wholesalers	Wholesale Trade	1
42421	Drugs and Druggists' Sundries Merchant Wholesalers	Wholesale Trade	0.82

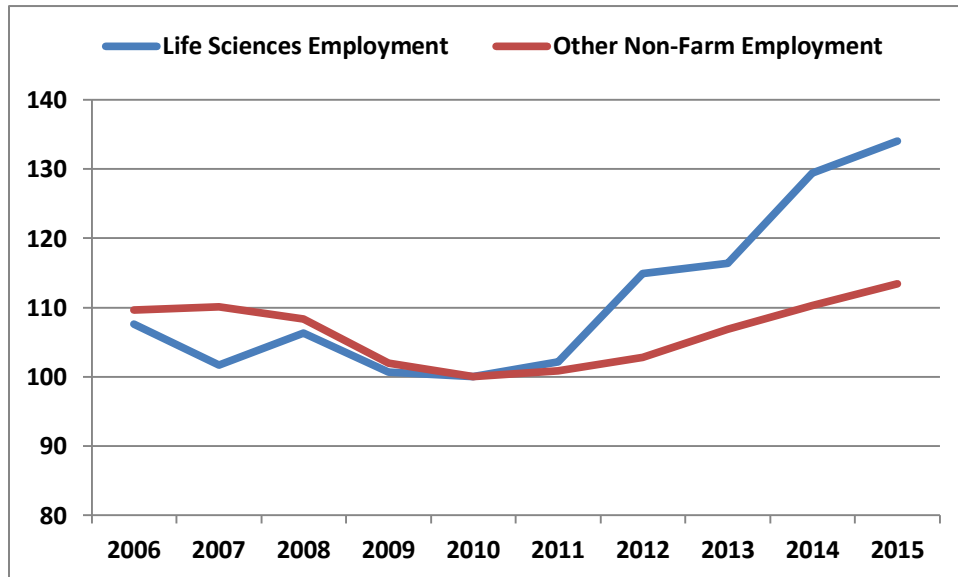
Source: California Life Sciences Association (www.CLSA.org)

Figure 5: Employment in Life Science Businesses, 2006 – 2015 (Q2), NBLSA Counties



Sources: EDD (www.edd.ca.gov) and BLS (www.bls.gov) and CLSA NAICS Definitions

Figure 6: Marin County Housing Prices, Life-Science Employment and Other Employment Index 2010 = 100, 2006-2015

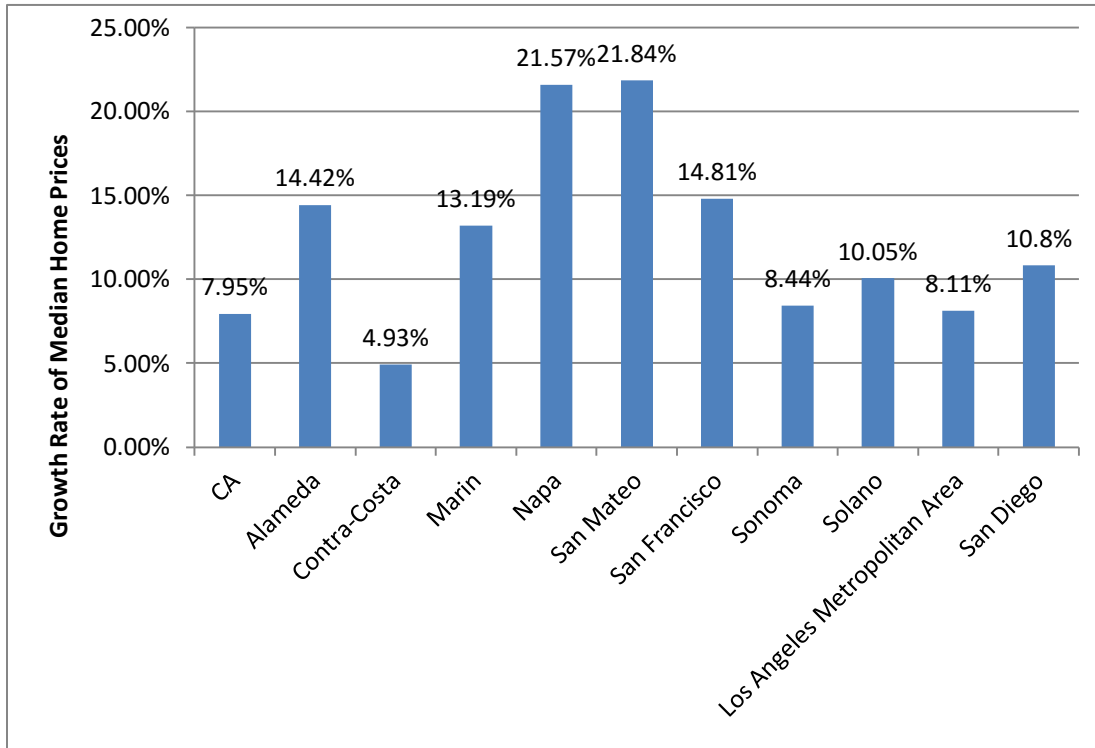


Sources: www.car.org, California EDD and NBLSA

Housing

Housing markets experienced regional growth again in 2015, as interest rates remained low and regional jobs and income growth continued to support high housing prices. Figures 7 and 8 provide data indicate the percentage growth in home prices during 2015, according to the California Association of Realtors® (www.car.org), and the median, single-family home prices as of January 2016.

**Figure 7: Percentage Growth in Median Single-Family Home Prices, 2014 - 2015
NBLSA Counties and Selected Areas**



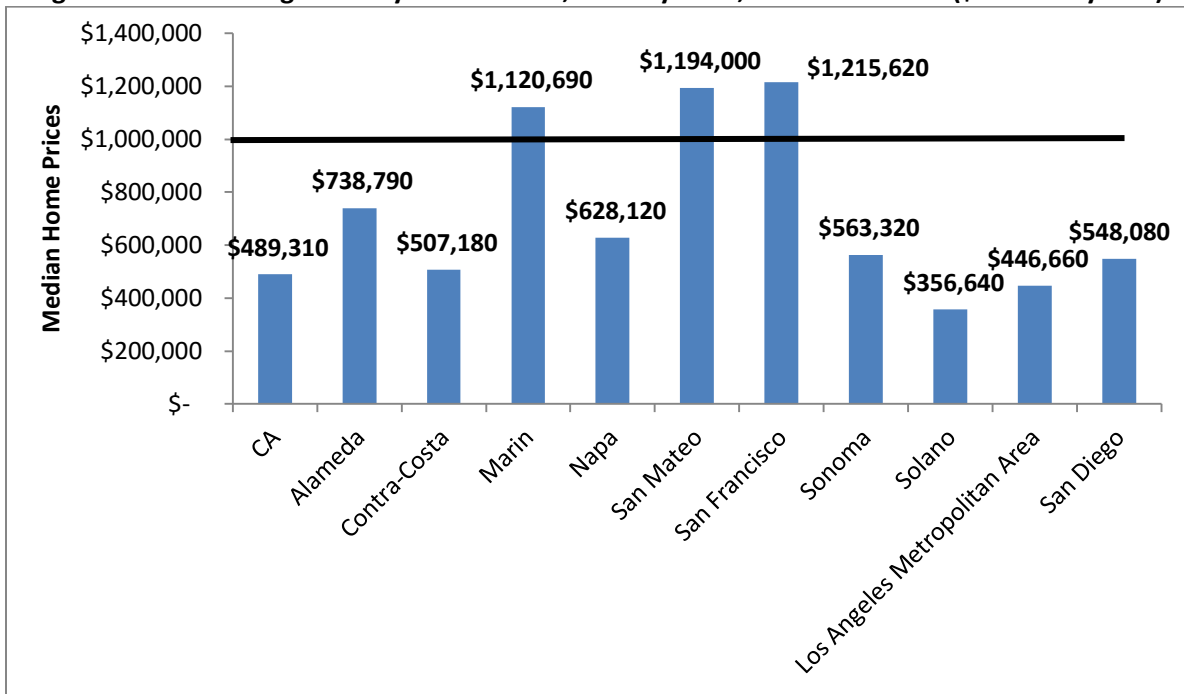
Source: www.car.org

Connecting the Dots: Employment and Housing Price Growth

The growth of life-science employment supports more housing demand, purchases of goods and services, and more support for jobs and local tax receipts. Figures 9 and 10, indexed to 2010, show the annual housing prices compared to annual employment in life science and all other businesses in these counties. Jobs growth has been more correlated with housing prices growth since 2010 than growth of jobs outside of life-science businesses. Marin and Solano have been strong life science markets for employment and businesses outside San Francisco and San Mateo counties.

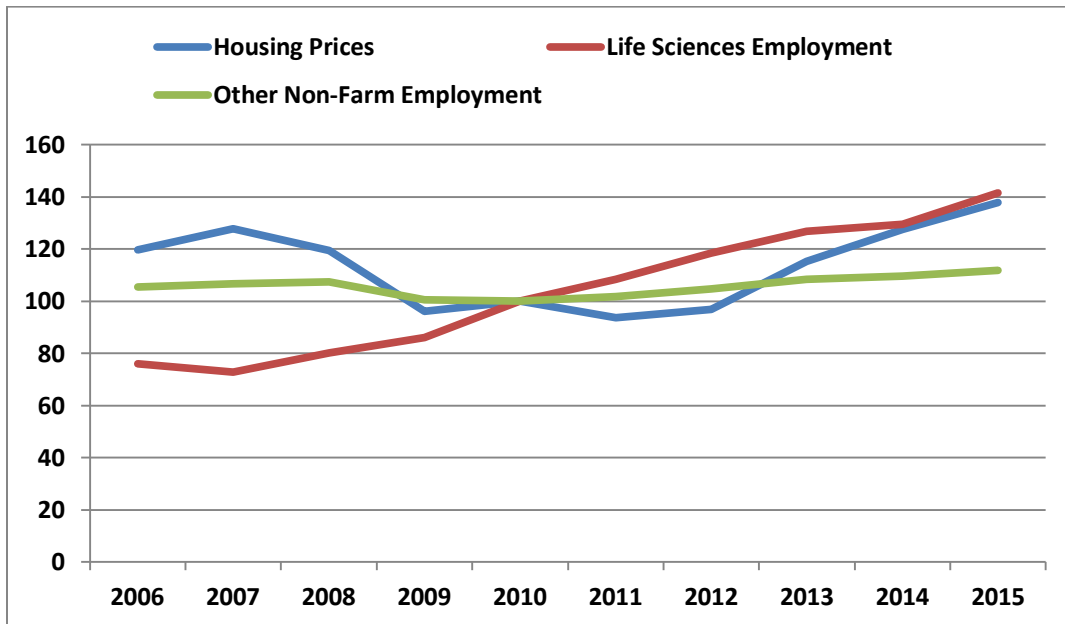
In Marin County (Figure 9), housing prices fell toward their bottom in 2010, but not with the magnitude of change as experienced in Solano County (Figure 10). Solano County while still not having recovered fully has recovered the most.

Figure 8: Median Single-Family Home Prices, January 2016, NBLSA Counties (\$1M Heavy Line)



Source: www.car.org

Figure 9: Marin County Housing Prices, Life-Science Employment and Other Employment Index 2010 = 100



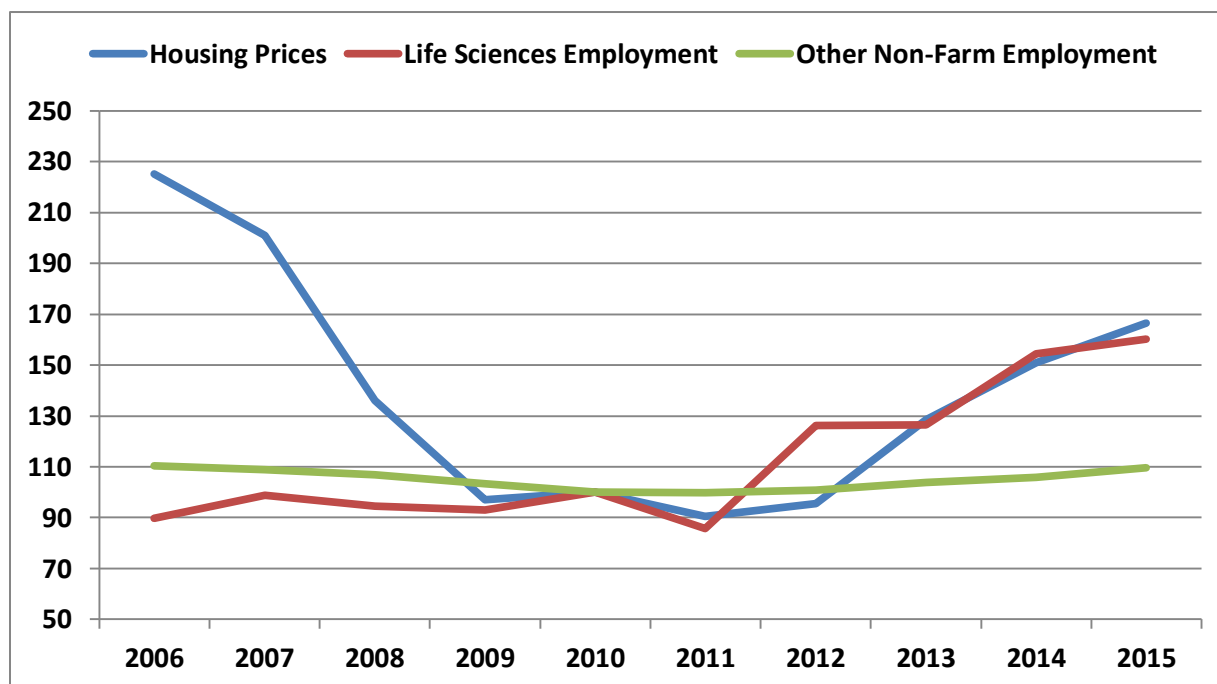
Sources: www.car.org, California EDD and NBLSA

In both counties, life-science jobs increased through the recent recession and perhaps helped to stabilize the local economy. However, in both cases, the movement of housing prices in Marin and Solano counties seems highly connected to life-science jobs versus general employment in other

industries. While this is not a causal relationship, it may speak to the idea that life-science jobs are more likely to enhance local employment where workers also reside locally, supporting housing demand.

For example, in Marin County, the growth of life-science jobs is about 27 percent since 2010, and housing prices have increased about 37 percent over the same time; overall employment in Marin County grew by only 12 percent otherwise since 2010. In Solano County, there has been a 60 percent increase in life-science jobs, fueled by growth at major global firms. Housing prices have increased 66 percent since 2010, but employment outside life-science has only increased by 9.6 percent. The labor market recovery overall in Solano County started after the rest of the NBLSA counties, but the housing market and life-science employment recovered sooner.

**Figure 10: Solano County Housing Prices, Life-Science Employment and Other Employment
Index 2010 = 100**



Sources: www.car.org, California EDD and NBLSA

Transportation

In 2016, the North Bay counties of Sonoma and Marin will be connected by a new light rail system.⁴ This service, called the Sonoma-Marín Area Rapid Transit or SMART, connects residential areas in these two counties with major commercial real estate stops to the Larkspur Ferry Terminal, which then connects the North Bay to San Francisco through mass

⁴ See <http://main.sonomamarintrain.org/> for more on this rail service, stops, schedule, and dates of beginning service.

transportation. This additional asset saves time and costs for all businesses in the North Bay and provides a rapid transit option not previously available above the Golden Gate Bridge.

NBLSA Counties' Residents in Life-Science Jobs: Education, Age and Wages

Tables 3 – 8 shows the demographics of residents, and reflects potential hiring pools of local life-science businesses. Some of these workers are employed in the Bay Area but outside the NBLSA counties. Each set of tables shows the latest data (2014) as compared to Census 2010, which is also consider the bottom of the most recent recession.

Napa Valley College, Solano Community College, College of Marin, and the Santa Rosa Junior College are all candidates to provide training and coursework to lab technicians, lab assistants, and other clinical staff as needed for life-science businesses. Dominican University has coursework in biology and historic agreements with the Buck Institute for placing interns and new graduates in technical positions. Sonoma State University has biology programs at both the undergraduate and graduate levels.

Table 3: Educational Attainment in Life-Science Workers by Geography, 2014, Number of Workers

Educational Level	Marin	Napa	Solano	Sonoma	San Francisco	San Mateo	San Diego
Not a High School Graduate	83		65	213	374	370	1,783
High School Graduate	243	98	475	670	1,041	1,152	5,584
Some College or Associate's Degree	656	623	2,107	2,159	2,539	3,718	17,749
Bachelor's Degree	1,148	225	1,762	1,558	4,007	11,013	21,306
Post-Baccalaureate	1,122	80	917	1,488	4,668	12,337	18,009
Totals	3,252	1,026	5,326	6,088	12,629	28,590	64,431

Source: American Community Survey, 5-year average, Calculations by Marin Economic Consulting

Table 4: Education of Life-Science Workers by Geography, 2010 Census, Number of Workers

Educational Level	Marin	Napa	Solano	Sonoma	San Francisco	San Mateo	San Diego
Not a High School Graduate	19		3	90	290	319	1,632
High School Graduate	348	202	521	1,255	798	1,473	6,478
Some College or Associate's Degree	653	248	1,524	2,091	2,438	4,976	15,933
Bachelor's Degree	1,269	303	1,589	2,092	3,998	10,151	20,602
Post-Baccalaureate	923	141	428	1,282	3,492	10,312	18,060
Totals	3,212	894	4,065	6,810	11,016	27,231	62,705

Source: 2010 Census, Calculations by Marin Economic Consulting

UC Davis is on Solano County’s eastern border, and UC Berkeley and UCSF are within 20 miles of Marin County. Earnings of workers in life science tend to be higher than in the rest of the local economy. Life-science businesses tend to attract older, more educated workers on average. In terms of educational pipeline, there are higher-education institutions in these counties, but their scope is somewhat limited for primary life-science research. This is a challenge to be met by these institutions as life-science employment grows.

Table 5: Age of Life Science Workers by Geography, 2014, Number of Workers

Age Range	Marin	Napa	Solano	Sonoma	San Francisco	San Mateo	San Diego
15-18					38	70	122
18-24	210	78	438	684	1,562	1,968	10,642
25-34	1,912	216	2,316	2,480	7,820	13,074	31,484
35-49	2,454	586	4,020	4,160	9,424	28,230	48,024
50-64	1,536	1,090	3,652	4,342	5,868	12,722	34,778
65-74	328	82	168	510	520	1,032	3,480
75+	64		58		26	84	332
All	6,504	2,052	10,652	12,176	25,258	57,180	128,862

Source: American Community Survey, 5-year average, Calculations by Marin Economic Consulting

Table 6: Age of Life Science Workers by Geography, 2010, Number of Workers

Age Range	Marin	Napa	Solano	Sonoma	San Francisco	San Mateo	San Diego
15-18	38			146	60	26	144
18-24	630	78	498	910	1,458	2,252	8,084
25-34	1,938	232	1,542	3,148	6,996	14,296	32,580
35-49	2,412	908	3,400	5,202	8,710	26,132	51,916
50-64	1,372	548	2,550	3,754	4,214	10,782	29,994
65-74	34	22	42	374	398	794	2,228
75+			98	86	196	180	464
All	6,424	1,788	8,130	13,620	22,032	54,462	125,410

Source: Census 2010, 5-year average, Calculations by Marin Economic Consulting

The education profile of Marin County moves in sync with the Bay Area until the more advanced degrees, and outpaces the overall Bay Area in more-educated categories.

The earnings profiles rises as workers become more educated. The growth of wages is more rapid in life science than overall jobs, but is likely to follow other industries where scientific education is paid a premium.

Table 7: Wages of Life Science Workers by Education and Where They Live, 2014, Current Dollars

Level of Education	Marin	Napa	Solano	Sonoma	San Francisco	San Mateo	San Diego
Not a High School Graduate	\$40,186		\$55,489	\$15,727	\$12,549	\$37,654	\$28,639
High School Graduate	39,857	39,012	52,466	40,566	48,268	51,821	36,220
Some College or Associate's Degree	97,973	60,132	59,133	50,224	46,977	71,415	46,682
Bachelor's Degree	75,675	93,249	78,912	90,922	79,486	94,392	78,954
Post-Baccalaureate	123,764	97,202	132,596	123,858	106,084	160,453	126,076
All	\$93,182	\$68,268	\$77,686	\$76,367	\$78,226	\$117,460	\$78,139

Source: American Community Survey, 5-year average, Calculations by Marin Economic Consulting

Table 8: Wages of Life Science Workers by Education and Where They Live, 2010, Current Dollars

Level of Education	Marin	Napa	Solano	Sonoma	San Francisco	San Mateo	San Diego
Not a High School Graduate	\$25,412		\$35,379	\$19,422	\$19,695	\$51,137	\$26,540
High School Graduate	63,802	53,833	59,389	37,551	36,127	45,686	36,084
Some College or Associate's Degree	33,577	73,331	51,316	49,967	47,226	61,562	50,510
Bachelor's Degree	69,840	82,552	84,204	76,460	73,131	91,410	77,936
Post-Baccalaureate	123,249	202,308	117,761	119,629	89,928	160,103	116,094
All	\$76,899	\$92,393	\$72,191	\$68,528	\$68,635	\$109,024	\$76,296

Source: Census 2010, 5-year average, Calculations by Marin Economic Consulting

Major Businesses in the NBLSA

There are major, multinational pharmaceutical and medical device companies with headquarters and branch offices in the NBLSA counties. Non-profit research also takes place here at The Buck Institute for Aging Research in Novato. It was the first research facility in the county to respond to the Institute of Medicine's (see <http://www.nationalacademies.org/hmd/>) call for the establishments of at least 10 Centers of Excellence to undertake the study of aging. There are also a wide variety of businesses that fall under the umbrella of the life-science industry; data shown earlier suggest there are over 470 business operations in the NBLSA's four counties, including stand-alone, local

businesses and branches of global companies. Table 9 provides some of the major players by county.

Table 9: Major Life Science Employers, NBLSA Counties

Marin	Solano/Napa	Sonoma
Alpine Pharmaceuticals	Allied Biotech , Inc.	Biosearch Technologies Inc.
AngioCure	Battelle Memorial Institute	Boracchia + Associates
Bio Plas, Inc.	Chemsw Inc.	Claret Medical Inc.
BioCision, LLC	DesignRx Pharmaceuticals	Direct Flow Medical Inc.
BioMarin	Gene And Cell Technologies	Dow Pharmaceutical Sciences
Buck Institute for Aging Research	Genentech	Endomatrix Inc.
CP Lab Safety	Intertek Group	Glixis Therapeutics, LLC
Cytograft Tissue Engineering Inc.	Johnson & Johnson	IDEX Health & Science
G2B Pharma	MuriGenics, Inc.	Labcon, North America
Glialogix	MyeloRx	Laboratory Corporation of America
Lippomix	Novici Biotech LLC	Medtronic
Marin Biologic Laboratories, Inc.	Radnet	MicroMed Laboratories
Medidata Solutions		NeilMed Pharmaceuticals Inc.
MicroCam		Oculus Innovative Sciences
Mount Tam Biotechnologies		Osseon Therapeutics Inc.
Naia Pharmaceuticals		Radiant Research
NewGen Surgical		Raydiance, Inc.
Otogenix		Relucent Solutions LLC
Parnell Pharmaceuticals Inc.		SMC Ltd. - Stoesser
PPD, Inc.		Sonoma Orthopedic Products
PulmoGeniX		Targeted Cancer Therapeutics LLC
QURE Healthcare		Thermo Fisher Scientific
Raptor Pharmaceutical		TriVascular, Inc.
RetinalGenix		Wright Engineered Plastics
Sanovas		
Simpatika Medicine, Inc.		
Sutter Instrument Company		
Taxon Biosciences, Inc.		
TetraQ		
Ultragenyx Pharmaceutical Inc.		
XCell Science		
Teijin Pharma		

Sources: Dun and Bradstreet (2015) and California EDD (2015)

Wage by Occupation by County

The number of life-science occupations that may be at various types of businesses are shown below. These are specific to science jobs of these industries, not sales and administration jobs. In Table 10 notice that all these occupations pay more than the median for all occupations in the NBSA counties as of quarter 1 2015 (the latest available data). Growth in median wages is shown here also as a way to see how these jobs are paid more across the spectrum of possible jobs.

**Table 10: Wages and Wage Equivalents, Hourly Pay, Life Science Occupations
Growth Rates and Comparisons to California overall**

2015 Wages	California	Marin	Solano	Sonoma	Napa
Food Scientists and Technologists	\$29.06		\$38.04	\$30.63	\$29.04
Biochemists and Biophysicists	46.99	51.59			
Microbiologists	43.65	51.73		40.31	
Zoologists and Wildlife Biologists	28.99	38.72		39.02	
Biological Scientists, All Other	38.87	42.80			
Epidemiologists	35.40				
Medical Scientists, Except Epidemiologists	47.89	56.38	51.85	49.95	
Life Scientists, All Other	41.36	37.06			
Biological Technicians	23.06	34.39	28.33	18.00	
Chemical Technicians	21.52	25.91	18.44	20.76	
Environmental Science and Protection Technicians, Including Health	22.69	23.37	24.13	28.13	30.62
Life, Physical, and Social Science Technicians, All Other	22.72	21.51	19.64	25.81	
Soil and Plant Scientists	30.93				34.72
Conservation Scientists	34.86	44.13	30.28	36.82	43.95
All Occupations	\$19.20	\$25.75	\$18.94	\$19.01	\$18.00

Source: <http://www.labormarketinfo.edd.ca.gov/data/oes-employment-and-wages.html>

**Table 10: Wages and Wage Equivalents, Hourly Pay, Life Science Occupations
Growth Rates and Comparisons to California overall**

2014-15 Growth Rates	California	Marin	Solano	Sonoma	Napa
Food Scientists and Technologists	1.89%		60.98%	17.13%	7.00%
Biochemists and Biophysicists	4.52%	2.44%			
Microbiologists	2.88%	1.93%		-0.57%	
Zoologists and Wildlife Biologists	-5.14%	-2.54%		18.06%	
Biological Scientists, All Other	3.87%	2.47%			
Epidemiologists	-2.07%				
Medical Scientists, Except Epidemiologists	5.28%	6.72%	-1.24%	8.56%	
Life Scientists, All Other	3.50%	25.25%			
Biological Technicians	6.22%	6.73%	-7.30%	-2.81%	
Chemical Technicians	1.94%	10.40%	-3.46%	2.27%	
Environmental Science and Protection Technicians, Including Health	1.16%	-0.89%	-5.19%	8.86%	31.02%
Life, Physical, and Social Science Technicians, All Other	4.56%	19.24%	-8.05%	3.86%	
Soil and Plant Scientists	-7.09%				-2.99%
Conservation Scientists	1.01%	-1.71%	9.00%	1.24%	5.78%
All Occupations	1.59%	3.33%	-1.10%	2.04%	1.41%

Source: <http://www.labormarketinfo.edd.ca.gov/data/oes-employment-and-wages.html>

The wage payments, the revenues made by these businesses, the grant and venture capital fund, all contribute to spending in the local economies. The economic impacts of these businesses touch almost every industry in this region. These wages are converted by employees, along with regional business spending, into broad economic impacts on almost every employer, resident and local government in these four counties and beyond.

Economic Impacts and the Effects of Life Science Jobs

Like any other industry, life-science businesses are economically connected to other businesses through a variety of commercial arrangements. The economic impact analyses provide ways to see the breadth of effects on the City of Novato. The economic impacts come in three categories and each has three stages of effects. The three categories are new business revenues, supported jobs (as full-time

equivalent positions) and new state and local tax revenues. The community impacts are connected to both new state and local tax revenues used for community purposes, but there are also social benefits in terms of larger, local education connections to life-science job opportunities and expanded scientific space.

The supported jobs represent new, overall employees that are new workers in life-science (direct) or elsewhere in the county economy based on the new business income growth (indirect and induced). State and local taxes are new, annual tax receipts that originate in Marin County from the new business incomes and employees mentioned above and summarized in Table 11 for 2014 (the latest data available).

Table 11: Summary Economic Impacts, Incremental Benefits, 2014

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	100	12,284,607	16,428,250	29,921,693
Indirect Effect	79	3,942,402	6,272,076	10,343,735
Induced Effect	61	2,795,152	5,103,290	8,202,099
Total Effect	239	19,022,161	27,803,617	48,467,527

Summary Economic Impacts, Incremental Benefits, Major Industries, 2014

Description	Employment	Labor Income	Value Added	Output
Scientific research and development services	103	\$12,647,254	\$16,913,168	\$30,811,930
Real estate	20	628,467	2,367,817	3,491,251
Marketing research/Other Professional Services	12	521,652	572,748	941,612
Employment services	9	370,889	396,804	663,308
Limited-service restaurants	7	329,727	537,638	785,973
Full-service restaurants	6	325,817	381,655	700,759
Architectural, engineering, and related services	5	280,206	276,512	548,044
Individual and family services	4	107,837	137,849	225,359
Hospitals	3	158,360	231,944	362,462
Retail - Food and beverage stores	3	150,079	183,431	274,265
All Others	67	\$3,501,873	\$5,804,051	\$9,662,564
Totals	239	\$19,022,161	\$27,803,617	\$48,467,527

Source: IMPLAN® and Marin Economic Forum

In Table 11, each year's increase in workers increases commercial space use, business revenues for life-science businesses and many others, and supports the growth of quality jobs. By the end of 2016, 300 workers may have come to Marin County as additional workers in this cluster. The economic benefits do not end at the county borders. Sonoma, Napa and Solano counties may also benefit from growth in Marin County by housing workers, providing financing options, and also experiencing growth in life-science businesses and workers as the cluster becomes more regional.

If bioscience research firms need equipment, laboratory supplies, specific waste disposal services, and other direct support needs, these industries should be developed parallel to bioscience firms. Combining the economic impact data with commercial real estate data also provides a way of estimating the commercial space needs for both the bioscience employer and those businesses that expand because of the new employer. Further, building residential units instead of scientifically-focused commercial space would have fewer economic impacts when comparing new residents to new workers and businesses on the same parcels.

Summary: Regional Strengths and Areas for Improvement

There are five areas NBLSA should monitor as the life-science industry clusters expand:

1. Knowledge and Talent: Good Progress

- BioMarin is a dominant firm with approximately 1,200 employees and continues to grow in Marin County, where life science is approximately 1.4 percent of employment;
- Solano County is home to global leaders in biopharma (Genentech), life science businesses employ approximately 3 percent of Solano County's workforce (health care is another 11 percent);
- Sonoma County has also seen growth in life science, now approximately 2.5 percent of total employment, with firms such as Medtronic and TriVascular.
- North Bay colleges and universities, along with the Buck Institute for Aging Research, are potential partners in the life science industry's expansion over time.

2. Established Businesses

- There are approximately 470 life-science-related branches and businesses in the NBLSA area, identified across over 20 subindustries;
- Genentech, BioMarin, Medtronic and TriVascular are the dominant players in the North Bay Life Science Alliance counties.
 - i. 94 businesses with global reach are identified in this report;
 - ii. Payroll data suggests there are an additional 360 life-science businesses throughout the NBLSA counties;

iii. Marin County has more life-science businesses than its regional counterparts;

- Firms range from scientists who are consultants to global biopharmaceutical companies with research and manufacturing campuses.

3. Financing and Commercial Real Estate

- BioMarin expanded in San Rafael both for lab space and parking for employees;
- NIH funding in the NBSA area grew slightly in 2015;
- Venture capital deals may be trending to a slower growth rate across all technology industries, including life science, but...
- Commercial real estate is available, as pricing in the Bay Area's life-science clusters suggest migration. Concurrently, industrial space becomes scarcer every month.

4. Regional support for growth

- The SMART rail system accesses major transportation and commercial real estate hubs, and adds value to businesses growing within or coming to Marin and Sonoma counties by reducing commute times and increasing productivity;
- Solano County declared one of its industry clusters for medical and life science exclusively;
- Sonoma County increased its focus on life science, where a new gigabit fiber network now exists in the center of its medical device cluster of commercial buildings;
- Marin County saw BioMarin grow its footprint in San Rafael without major political resistance, and
- Marin County secured, through the City of Novato, a tax credit for Ultragenyx (based on their hiring 100 new employees over three years) of \$2.4 million.

5. Economic Impacts

- All counties in the NBSA is a potential supply or value chain partner for the others;
- The conversion of venture capital and grant funding creates economic vitality across a wide array of businesses, not just in life science;
- 100 new workers in the NBSA area implies over \$48 million of new business income and another 120 jobs supported in other industries on average; and
- The multiplier effect of the 10,000 workers is estimated at \$4.8 billion of a \$65 billion regional economy (approximately 7.3 percent).

Appendix

Table A-1: Sample of Businesses located in NBLSA, 2015

Corporate Name	Description	City	County
Allied Biotech , Inc.	biomedical research and animal diagnostics labs	Vallejo	Solano
Alpine Pharmaceuticals company	sinecch™ (homeopathic remedy for reducing bruising & swelling) manufacturer	San Rafael	Marin
AngioCure	medical device	San Rafael	Marin
Battelle Memorial Institute	research & development	Vallejo	Solano
Bio Plas, Inc.	Laboratory disposables	San Rafael	Marin
BioCision, LLC	develops solutions for process standardization through the application of advanced thermal regulation technologies	San Rafael	Marin
BioMarin	develops biopharmaceuticals	Novato	Marin
Biosearch Technologies Inc.	nucleic acid based product design & manufacturing	Petaluma	Sonoma
Boracchia + Associates	provides medical products and solutions	Petaluma	Sonoma
Buck Institute (Buck Institute for Research on Aging)	contract research/ biotech/biomed companies, drug companies, research scientists/labs	Novato	Marin
California Peptide Research (Echelon Biosciences)	biotechnology, peptides	Napa	Napa
Chemsw Inc.	scientific & laboratory software	Fairfield	Solano
Claret Medical Inc.	develops endovascular technology	Santa Rosa	Sonoma
CP Lab Safety	laboratory supplies	Novato	Marin
Cytograft Tissue Engineering Inc.	cardiovascular medicine	Novato	Marin
DesignRx Pharmaceuticals	small molecule	Vacaville	Solano
Direct Flow Medical Inc.	transcatheter heart valve technologies developer	Santa Rosa	Sonoma
Dow Pharmaceutical Sciences	pharmaceutical clinical trial services	Petaluma	Sonoma
Endomatrix Inc.	develops endothelial maintenance platform	Santa Rosa	Sonoma
G2B Pharma	nasally-delivered epinephrine	Corte Madera	Marin
Gene And Cell Technologies	regenerative medicine company	Vallejo	Solano
Genentech	biotechnology corporation	Vacaville	Solano
Glialogix	pharmaceutical company developing a therapeutic treatment for MS	Larkspur	Marin
Glixis Therapeutics, LLC	Bioscience company focused on R&D of therapeutics for autoimmune disease	Santa Rosa	Sonoma

Sources: Dun and Bradstreet (2015), EDD (2015), and Author's Calculations

Table A-1: Sample of Businesses located in NBLSA, 2015 (cont.)

Corporate Name	Description	City	County
Heragen	Molecular diagnostics company	Benicia	Solano
IDEX Health & Science	market leader in fluidic pathway products and applications	Rohnert Park	Sonoma
Intertek Group	testing laboratories	Benicia	Solano
Johnson & Johnson	medical devices, pharmaceutical and consumer packaged goods	Vacaville	Solano
Labcon, North America	produce labware	Petaluma	Sonoma
Laboratory Corporation of America	esoteric testing, genomics, and clinical and anatomic pathology	Petaluma	Sonoma
Lippomix	research institute, contract R&D	Novato	Marin
Marin Biologic Laboratories, Inc.	pharmaceutical, biotechnology, diagnostic, agricultural and legal markets	Novato	Marin
Medidata Solutions	clinical trial, leader in clinical technology	Ross	Marin
Medtronic	medical device company	Santa Rosa	Sonoma
MicroCam	surgical cameras	San Rafael	Marin
MicroMed Laboratories	fully equipped laboratory and a wide spectrum of microbiology tests	Petaluma	Sonoma
Mount Tam Biotechnologies	biotechnology, specialty drugs for lupus	Novato	Marin
MuriGenics, Inc.	pharmaceuticals (in-vivo and in-vitro contract drug discovery and development services)	Vallejo	Solano
MyeloRx	develops drugs for oncology and immune-related diseases	Vallejo	Solano
Naia Pharmaceuticals	Drug discovery and development	Greenbrae	Marin
NeilMed Pharmaceuticals Inc.	pharmaceutical company	Santa Rosa	Sonoma
NewGen Surgical	medical devices & surgical products	San Rafael	Marin
Novici Biotech LLC	biotechnology company	Vacaville	Solano
Oculus Innovative Sciences	healthcare products	Petaluma	Sonoma
Osseon Therapeutics Inc.	medical devices for the treatment of vertebral compression fractures	Santa Rosa	Sonoma
Otogenix	catheters and sinus imaging systems	San Rafael	Marin

Sources: Dun and Bradstreet (2015), EDD (2015), and Author's Calculations

Table A-1: Sample of Businesses located in NBLSA, 2015

Corporate Name	Description	City	County
Parnell Pharmaceuticals Inc.	develops products to aid those with dryness of the skin and tissues of the body	San Rafael	Marin
PPD, Inc.	full service product development	Novato	Marin
PulmoGeniX	asthma diagnosis and treatment device	San Rafael	Marin
QURE Healthcare	uses case-based simulation to do external performance evaluation	San Rafael	Marin
Radiant Research	clinical research	Santa Rosa	Sonoma
Radnet	medical diagnostic imaging centers	Vacaville	Solano
Raptor Pharmaceutical	develops therapeutics that treat rare, debilitating and often fatal diseases	Novato	Marin
Raydiance, Inc.	Manufacturer of world's first software-controlled ultrashort pulse (USP) laser.	Petaluma	Sonoma
Relucent Solutions LLC	Stents and orthopedics manufacturer	Santa Rosa	Sonoma
RetinalGenix	imaging	San Rafael	Marin
Sanovas	minimally-invasive surgical tools	San Rafael	Marin
SimpatICA Medicine, Inc.	Digital health and precision medicine company	San Anselmo	Marin
SMC Ltd. - Stoesser	Contract manufacturer of devices for the health care industry.	Santa Rosa	Sonoma
Sonoma Orthopedic Products	medical devices/ doctors, hospitals, patients	Santa Rosa	Sonoma
Sutter Instrument Company	Manufacturer of biomedical research instrumentation.	Novato	Marin
Targeted Cancer Therapeutics LLC	discovery and development of therapies for treating cancer	Santa Rosa	Sonoma
Taxon Biosciences, Inc.	Uses proprietary advances in genomics, microbio, and bioinformatics to solve mission critical challenges in the energy health and agriculture industries	Tiburon	Marin
Teijin Pharma	Bioscience organization	Novato	Marin
TetraQ	commercial and regulatory compliant preclinical and clinical contract research organization	San Rafael	Marin
Thermo Fisher Scientific	analytical instruments, laboratory supply chain programs and ecommerce, laboratory equipment, lab services, specialty diagnostics	Petaluma	Sonoma
TriVascular, Inc.	technologies for aortic disease	Santa Rosa	Sonoma
Ultragenyx Pharmaceutical Inc.	biotechnology company developing products for the treatment of rare disease	Novato	Marin
Wright Engineered Plastics	plastic injection molding service	Santa Rosa	Sonoma
XCell Science	therapeutic, cell biology stem cell research	Novato	Marin

Sources: Dun and Bradstreet (2015), EDD (2015), and Author's Calculations

Regional Educational Institutions and Life Sciences Programs

Santa Rosa JC	College of Marin	Napa Valley College	Solano Community College	Touro University	UC Davis	SSU	Dominican University
Sonoma	Marin	Napa	Solano	Solano	Solano/Yolo	Sonoma	Marin
Anatomy	Biotechnology	Biology	Biology	Health Sciences	Biotechnology	Biology	Biological sciences BA/MS
Biology	Biology	Plant Science	Industrial Biotechnology	Medical Doctor (MD)	Medical Doctor (MD)		Lab sciences MS
Botany		Ecology		Pharmacy	Pharmacy		
Microbiology					Biology		
Physiology					Ecology		
					Engineering		

Source: Marin Economic Forum

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