Levi Pace, Ph.D.
Senior Research Economist

Andrea Thomas Brandley
Senior Education Analyst

Economic Impacts of Utah's Life Sciences and Health Care Innovation Industry

Utah's life sciences and health care innovation industry creates substantial economic impacts across the state.

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Kem C. Gardner POLICY INSTITUTE
THE UNIVERSITY OF UTAH
DAVID ECCLES SCHOOL OF BUSINESS

411 East South Temple Street
Salt Lake City, Utah 84111
801-585-5618 | gardner.utah.edu

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Economic Impacts of Utah's Life Sciences and Health Care Innovation Industry

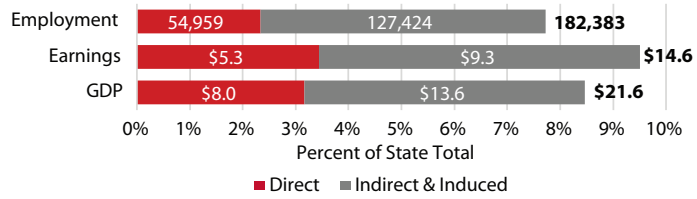
Analysis in Brief

Utah's life sciences and health care innovation (life sciences) industry creates substantial economic impacts across the state through high-paying jobs at companies in research, testing, and medical laboratories; medical devices and diagnostics; biosciences-related distribution; and therapeutics and pharmaceuticals. Life sciences companies provide technology, products, and services to improve individual and public health outcomes. The industry generates significant employment, earnings, and GDP impacts statewide in addition to offering high-wage jobs and strong job growth, supporting over $500 million in net positive fiscal impacts to state and local governments, and employing a diverse workforce. Additionally, higher education in Utah advances the life sciences industry through student learning, research funding, innovation, and commercialization.

Key Findings

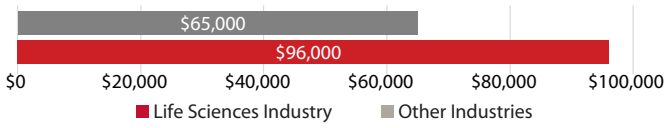
- **Employment –** Utah's life sciences industry directly provided an estimated 54,959 jobs and indirectly supported an additional 127,424 jobs in other industries in 2022.
- **Earnings –** Estimated average annual earnings for life sciences workers ($96,000) are nearly 50% higher than earnings for workers in other industries ($65,000). Utah's life sciences industry supported $14.6 billion in earnings in 2022 from direct, indirect, and induced economic impacts.
- **GDP** - In 2022, life sciences companies created an estimated $8.0 billion in GDP in Utah, part of the industry's statewide total economic impact of $21.6 billion in GDP.
- **Job Growth -** From 2012 to 2022, the number of jobs in Utah's life sciences industry increased by 5.1% per year on average versus 3.5% in other states and 3.4% in other Utah industries. Utah's 10-year average job growth in life sciences ranks third out of the 20 states with the largest life sciences employment.
- **Workforce Demographics –** In Utah, workers in the life sciences industry are more racially and ethnically diverse than workers in other industries, and a similar share of women work in life sciences compared to other industries.
- **University Innovation and Commercialization –** The National Institutes of Health provided $279.2 million in statewide funding in FY 2022, primarily for life sciences research at Utah's two R1 institutions. The University of Utah received 87.6% of the total, and Utah State University received 3.4%. Researchers at these universities were awarded 824 life sciences patents and launched 35 life sciences startups from 2018 to 2022.

Life Sciences Industry Economic Impacts in Utah, 2022
(Jobs; Billions of Dollars)



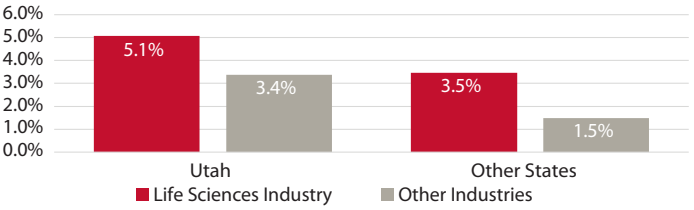
Note: Employment includes full-time and part-time jobs for employee and self-employed workers.
Source: Kem C. Gardner Policy Institute analysis of data from the Utah Department of Workforce Services and U.S. Bureau of Economic Analysis using REMI PI+ economic model

Average Annual Earnings per Worker in Utah's Life Sciences Industry, 2022



Note: Amounts rounded to the nearest $100. Earnings estimates include both employees and self-employed workers.
Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, personal communication; U.S. Bureau of Economic Analysis, Regional Data, Annual Personal Income and Employment by State; and REMI PI+ economic model

Industry Job Growth, 2012–2022
(Compound Annual Growth Rate for Employment)



Note: Averages include all employees (no self-employed workers) based on an industry definition that aligns with historical data availability across states. Results for other states include 49 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. For data and definition details, see Table 5.3 in Section 5 under Workforce and Growth Trends by State.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

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Section 1. Life Sciences Industry Profile

The life sciences and health care innovation (life sciences) industry applies knowledge of biological systems to health care. The industry includes research, manufacturing, and distribution. Its companies provide medical devices and diagnostics, therapeutics and pharmaceuticals, and services to pharmacies, medical providers, and other customers. In recent years, life sciences advances have occurred in disease diagnostics, digital health, genomics, and nanotechnology. The life sciences industry is also referred to as the biotechnology or biosciences industry.

Employment and wage results in this section represent direct economic activity from Utah life sciences companies themselves. Section 2 on economic and fiscal impacts covers indirect and induced effects generated by the industry.

This section begins with an overview of the life sciences industry in Utah, measured by its employment, income, and GDP. We offer some details on where companies are located in the state and where they sell their goods and services. We then provide workforce demographics for the life sciences industry and Science, Technology, Engineering, and Math (STEM) occupations.

Industry Definition

In March 2023, the Gardner Institute introduced an updated definition of Utah's life sciences and health care innovation industry.[1] The updated definition reflects economic and technological change since the Gardner Institute's industry definition in its 2018 report.[2] A national literature review with input and validation from BioUtah and BioHive leadership led to the identification of component industries and named companies in life sciences segments. The resulting definition discussed below is roughly comparable to most leading life sciences industry research in other states and nationwide, while accounting for Utah-specific industry attributes.

The Gardner Institute definition for Utah's life sciences industry includes every company in 17 industries with the following six-digit codes from the 2022 North American Industry Classification System (NAICS): 325411–4, 334510, 334516–7, 339112–5, 423450, 423460, 424210, 541713–4, and 621511(see Table 1.1).[3,4] Sections 1 and 2 employ an industry definition that also includes selected companies outside of the primary NAICS industries. Table 5.1 in Section 5 under Defining the Industry identifies handpicked companies with various NAICS codes and 126 corresponding Utah establishments.

As of 2022, Utah's life sciences industry included a total of 1,634 establishments. The total includes all 1,508 establishments in 17 NAICS industries, as well as 126 individually selected establishments spread across 41 other NAICS industries. An establishment is a business location. Since many companies have more than one Utah establishment, the number of life sciences companies is less than 1,634. The life sciences industry also includes an estimated 7,895 jobs for self-employed workers not shown in Table 1.1 but fully incorporated in the industry and economic impact analyses.

The life sciences industry is composed of four segments. Of Utah's 1,634 life sciences establishments in 2022, 48.6% were in biosciences-related distribution, 28.7% in research, testing, and medical laboratories, 13.3% in medical devices and diagnostics, and 9.4% in therapeutics and pharmaceuticals.

The Utah Department of Workforce Services (DWS) provided granular data on Utah life sciences aggregate wages and average monthly employment. DWS manages Utah data from the Quarterly Census of Employment and Wages (QCEW), which benefits from reporting requirements that apply to almost every employer.[5]

Economic Terms

- **Employment** is a measure of the average number of full-time and part-time jobs held by employees and self-employed workers. Companies report their employment to the Utah Department of Workforce Services by place of work, not by place of residence. Self-employed workers are sole proprietors or partners in companies without non-owner employees.
- **Wages** represent the amount companies pay their employees on an hourly or salary basis. Employee benefits and self-employment income are not included in wages.
- **Earnings** consist of employee compensation and proprietors' income from self-employment. Employee compensation is the sum of wage and salary disbursements, and supplements to wages and salaries (employee benefits).
- **Gross Domestic Product (GDP)** is the most commonly used measure of total economic activity in a region, reflecting the market value of all goods and services produced in Utah. GDP avoids double counting intermediate sales, and captures only the "value-added" to final products by capital and labor. GDP is equal to total output less the value of intermediate inputs purchased to produce that output.

Table 1.1: Life Sciences Industry Definition and Establishment Counts, 2022

Segment and Industry[1]	NAICS Code[1]	Establishments[2]
Research, Testing, and Medical Laboratories		
Research and Development in Nanotechnology	541713	44
Research and Development in Biotechnology (except Nanobiotechnology)	541714	191
Medical Laboratories	621511	166
Selected other research, testing, and medical laboratories (various industries)	multiple	67
Segment Total		**468**
Medical Devices and Diagnostics		
Electromedical and Electrotherapeutic Apparatus Manufacturing	334510	37
Analytical Laboratory Instrument Manufacturing	334516	15
Irradiation Apparatus Manufacturing	334517	9
Surgical and Medical Instrument Manufacturing	339112	57
Surgical Appliance and Supplies Manufacturing	339113	52
Dental Equipment and Supplies Manufacturing	339114	10
Ophthalmic Goods Manufacturing	339115	3
Selected other medical device companies (various industries)	multiple	35
Segment Total		**218**
Biosciences-Related Distribution		
Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers	423450	439
Ophthalmic Goods Merchant Wholesalers	423460	25
Drugs and Druggists' Sundries Merchant Wholesalers	424210	317
Selected other biosciences-related distributors (various industries)	Multiple	13
Segment Total		**794**
Therapeutics and Pharmaceuticals		
Medicinal and Botanical Manufacturing	325411	55
Pharmaceutical Preparation Manufacturing	325412	78
In-Vitro Diagnostic Substance Manufacturing	325413	3
Biological Product (except Diagnostic) Manufacturing	325414	7
Selected other therapeutic and pharmaceutical companies (various industries)	Multiple	11
Segment Total		**154**
Life Sciences Total[3]		**1,634**

Notes:
1. Industry titles and NAICS codes are from the 2022 North American Industry Classification System commonly used to categorize companies.
2. An establishment is a business location or unit. A company may have multiple Utah establishments. Counts do not include proprietorships with only self-employed workers or other companies without Utah employees. See Table 1.3 for segment-level self-employment estimates.
3. Total includes 1,508 establishments selected based on their NAICS industry and 126 handpicked establishments that the Gardner Institute identified with input from Utah's life sciences sector. For a list of handpicked establishments, see Table 5.1 in Section 5 under Defining the Industry.

Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Firm Find and personal communication

Private sector workers not represented in QCEW data are all self-employed workers, most workers on small farms and railroads, some domestic workers and nonprofit employees, and students working at schools. Since self-employed workers (proprietors) were the largest QCEW omission affecting a complete analysis of the life sciences sector, the authors estimated their employment and income based on data from DWS and the U.S. Bureau of Economic Analysis (see Table 1.3). The number of companies could not be reliably estimated from the number of self-employed workers, since many proprietorships have multiple owners.

As shown above, the life sciences industry includes four types of companies. These industry segments are research, testing, and medical laboratories; medical devices and diagnostics; biosciences-related distribution; and therapeutics and pharmaceuticals. Together, in 2022, they provided 54,959 full-time or part-time jobs, of which an estimated 7,895 jobs were for self-employed workers and the remainder were for employees of life sciences companies (see Table 1.2). Employment data from DWS do not report full- and part-time jobs as separate metrics. These workers earned an estimated $5.3 billion in employee compensation and proprietors' income. They generated $8.0 billion in professional services, manufactured goods, and other products, based on state GDP estimates. The life sciences industry was directly responsible for 3.2% of Utah's $253.8 billion in GDP in 2022.

Research, testing, and medical laboratories were the largest industry segment in Utah's life sciences sector in terms of 2022 employment, creating 18,643 jobs and paying $1.5 billion in

Table 1.2: Utah Life Science Industry Employment, Earnings, and GDP, 2022

(Jobs; Millions of Dollars)

Industry Segment	Employment		Earnings		GDP	
	Jobs	Share	Amount	Share	Amount	Share
Research, Testing, and Medical Laboratories	18,643	33.9%	$1,545.3	29.3%	$1,701.5	21.2%
Medical Devices and Diagnostics	17,103	31.1%	$1,655.4	31.4%	$2,559.6	31.9%
Biosciences-Related Distribution	10,372	18.9%	$1,240.6	23.5%	$2,036.8	25.4%
Therapeutics and Pharmaceuticals	8,841	16.1%	$832.1	15.8%	$1,734.0	21.5%
Total	**54,959**	**100.0%**	**$5,273.4**	**100.0%**	**$8,031.9**	**100.0%**

Note: Employment and wages are reported by life sciences companies. Earnings and GDP are estimates based on life sciences employment and wages, as well as Utah data by NAICS industry for employee compensation-to-wage ratios, self-employment rates, proprietors' income per worker, and value-added (GDP) per worker. NAICS is the North American Industry Classification System.

Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, personal communication; U.S. Bureau of Economic Analysis, Regional Data, Annual Personal Income and Employment by State; and REMI PI+ economic model

Table 1.3: Utah Life Sciences Industry Employees and Proprietors, 2022

(Jobs; Millions of Dollars)

Industry Segment	Employment[1]		Earnings	
	Employee	Self-Employed	Employee[2]	Self-Employed[3]
Research, Testing, and Medical Laboratories	13,752	4,891	$1,375.8	$169.6
Medical Devices and Diagnostics	15,644	1,459	$1,640.2	$15.3
Biosciences-Related Distribution	9,277	1,096	$1,088.7	$151.8
Therapeutics and Pharmaceuticals	8,391	450	$776.0	$56.0
Total	**47,064**	**7,895**	**$4,880.7**	**$392.7**
Share[4]	**85.6%**	**14.4%**	**92.6%**	**7.4%**

Notes: See Table 1.2 for employment and earnings totals for employees and self-employed workers combined

1. Employees work for a company they do not own. Self-employed workers are labelled "proprietors" in economic data. Life sciences companies reported employee job counts, and the Gardner Institute estimated proprietor employment based on employee jobs in life sciences and Utah self-employment rates by NAICS industry under the North American Industry Classification System.
2. Earnings for employees reported here includes payroll (wages and salaries) reported by companies and an estimate of employee benefits based on 2022 compensation averages by industry.
3. Self-employment earnings are estimates of proprietors' income calculated as self-employment jobs times average proprietors' income by NAICS industry in Utah for 2021, adjusted for inflation to 2022 dollars.
4. Share of total employment of 54,959 jobs and total earnings of $5,273.3 million in Utah's life sciences industry.

Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, personal communication; U.S. Bureau of Economic Analysis, Regional Data, Annual Personal Income and Employment by State; and REMI PI+ economic model

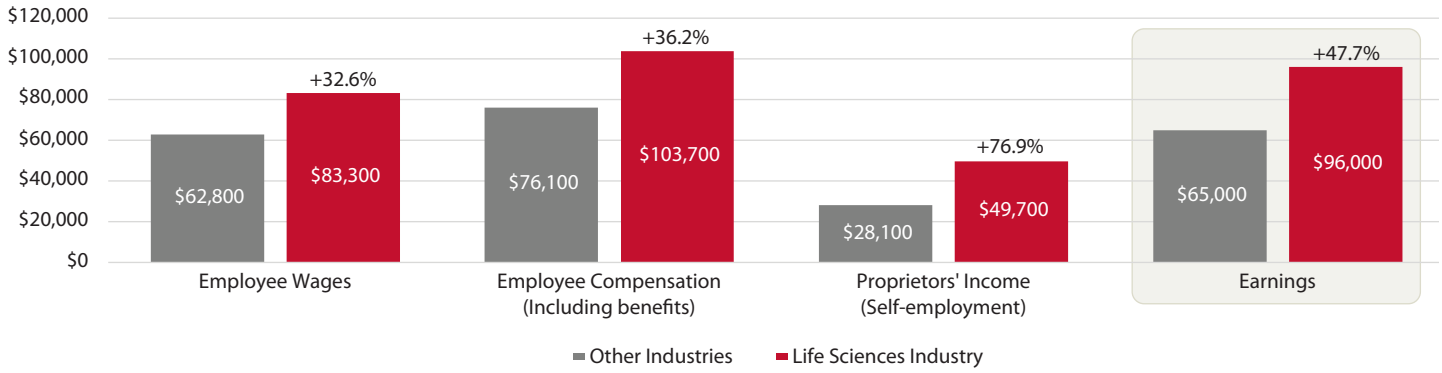
annual earnings. Companies in this industry segment develop and commercialize medicines, delivery systems, cell and gene therapy, and other treatments. Many workers are engaged in biotechnology, nanotechnology, and other health-related science research. Other workers perform diagnostic testing and conduct clinical trials. Contract services also fall under research, testing, and medical laboratories. These services include health care information technology, consulting, benefits management, and staffing support for life sciences companies.

In terms of earnings and GDP, the medical devices and diagnostics industry segment was the largest contributor within Utah's life sciences sector. Companies in this industry segment added $1.7 billion in earnings for Utah households and generated $2.6 billion in GDP, 31.4% and 31.9%, respectively, of the state's life sciences sector totals. These companies employed 17,103 Utahns. A national report showing medical devices and diagnostics employment by metropolitan statistical area (MSA) for the previous year, 2021, ranked Salt Lake City seventh in the nation, Utah's highest MSA ranking for any of the four industry segments.[6] Medical devices and diagnostics companies manufacture instruments, equipment, and supplies for medical and dental care. Their products have many applications, from routine procedures to advanced surgeries. These companies make, for example, prescription eyewear, digital instruments, and prosthetic and implantable devices.

The biosciences-related distribution industry segment generated 10,373 jobs, $1,240.6 million in earnings, and $2.0 billion in GDP. Wholesalers distribute drugs, pharmaceuticals, and medical devices and equipment to health care providers and pharmacies. This may involve specialized storage and monitoring, as well as inventory and supply automation.

Companies in the therapeutics and pharmaceuticals industry segment accounted for 8,841 jobs and $1.7 billion in GDP, one-sixth of the life sciences sector's employment and over one-fifth of its GDP. This industry segment manufactures therapeutic and pharmaceutical products for internal and external use. Examples include medication in vials, solutions, tablets, and ointments; biopharmaceutical drugs derived from human, animal, and plant sources; cell and tissue cultures; and vaccines.

Figure 1.1: Average Annual Earnings per Worker in Utah's Life Sciences Industry, 2022



Note: Amounts rounded to the nearest $100. Percentage labels for the life sciences industry indicate the percent difference compared to other industries. Life sciences wages and compensation are for its 47,064 employees. Life Sciences industry proprietors' income is for 7,895 self-employed workers. Earnings include both employees and self-employed workers. Average wages are calculated from company-reported employment and aggregate wages. Compensation and proprietors' income are estimated from wages based on Utah averages by NAICS industry under the North American Industry Classification System.
Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, personal communication; U.S. Bureau of Economic Analysis, Regional Data, Annual Personal Income and Employment by State; and REMI PI+ economic model

Labor Force

Utah's life sciences industry creates employment opportunities for both company employees and self-employed workers. In 2022, employees held 85.6% of the state's 47,064 life sciences jobs and earned 92.6% of the industry's earnings, including wages and benefits (Table 1.3).[7] Self-employed workers held the remaining 7,895 jobs (14.4% of the total) and received 7.4% of earnings in the Utah life sciences industry. Research, testing, and medical laboratories had the largest share of workers at 33.9%, and therapeutics and pharmaceuticals had the smallest share at 16.1% (see Figure 1.1).

Wages – Life sciences companies reported paying $3.9 billion in employee wages (excluding benefits) in Utah during 2022, an average of $83,263 per job. Employee wages in the life sciences industry were 32.6% above the statewide average in other industries ($62,786).

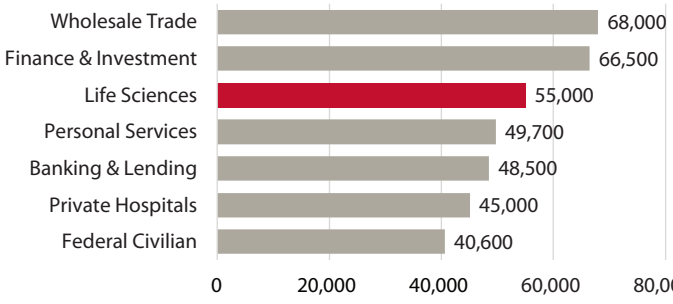
Compensation – Including benefits, total life sciences industry compensation was $4.9 billion, 3.7% of all employee compensation in Utah during 2022. Benefits were estimated from the ratio of compensation to wages in each industry in which life sciences companies operate. Average life sciences compensation per job was $103,704, which was 36.2% above the Utah average in other industries ($76,114).

Proprietors' income totaled an estimated $392.7 million. Proprietors' income is not separated into wages and benefits. Average proprietors' income in the life sciences industry was $49,737, 76.9% above the statewide average for other industries, $28,124. Many part-time, self-employed workers were also employees in companies, such that self-employment was not their only source of income.

Earnings – Finally, total life sciences industry earnings were $5.3 billion, 3.4% of all earnings in Utah in 2022. Earnings include both employee compensation and proprietors' income in life sciences. Average earnings in the life sciences industry were $95,951, 47.7% higher than the statewide average in other industries, $65,018.

Placed alongside 70 Utah industries, the life sciences industry had the 12th-highest direct employment in 2022. Figure 1.2 shows the six industries closest in size to the life sciences industry by employment level, industries with 40,000 to 70,000 jobs. At 54,960 jobs, life sciences was 13.4% larger than banking and lending services, 10.7% larger than personal services, and 17.3% smaller than finance and investment services.

Figure 1.2: Utah Employment in Selected Industries, 2022
(Number of Employee and Proprietor Jobs)



Note: Employment rounded to the nearest hundred for the life sciences industry and the six (of 70) industries within 15,000 jobs of life sciences. The life sciences industry overlaps wholesale trade by 10,373 jobs, 15.3% of all wholesale trade jobs in Utah. Finance and investment services include "securities, commodity contracts, and other financial investments and related activities," as well as "funds, trusts, other financial vehicles," but not insurance carriers. Personal services include hair, nail, skin, laundry, dry cleaning, pet care, parking lot, garage, and other services. Banking and lending services include "monetary authorities, central bank" and primarily "credit intermediation and related activities." The latter component includes commercial banking, credit unions, consumer lending, and other depository and nondepository credit intermediation and related activities. Hospitals include general medical, surgical, psychiatric, substance abuse, and specialty hospitals that are privately owned (e.g., not the VA Medical Center or University of Utah Hospital). Federal civilians include non-military federal employees in Utah.
Source: REMI PI+ economic model

Companies

Life sciences companies include small businesses and large enterprises. In 2022, 64.0% of Utah life sciences establishments had 1 to 4 jobs, well above the 57.4% average for other industries (see Table 1.4). On the other end of the spectrum, 4.7% of life sciences establishments offered at least 100 jobs, versus 2.2% of establishments in other industries. In the middle, 19.4% of life sciences establishments had 5 to 19 jobs versus 28.4% in other industries, and 12.0% of life sciences had 20 to 99 jobs, matching the average share for other industries.

In 2022, Utah's 15 largest life sciences companies by employment were in three segments: medical devices and diagnostics (nine companies); research, testing, and medical labs (four); and biosciences-related distribution (two) (see Table 1.5). ARUP Laboratories provided the most employment of any life sciences company, and at least nine others had 1,000 or more jobs. Collectively, the largest 15 companies represent 38.5% to 70.9% of Utah's life sciences jobs (18,105 to 33,379 jobs divided by 47,064 total from DWS in Table 1.3).

County and City Presence

Life sciences companies provide jobs throughout Utah. A county-level review of life sciences employment and wages shows their relative importance in local economies. A data query by the Utah Department of Workforce Services for this study yielded life sciences industry employment for 23 of 29 counties in Utah. These data do not include self-employed workers or proprietors' income.

In 2022, Cache County led the state in its life sciences share of county employment, 4.7%, and ranked fourth among counties for its employment level of 3,207 jobs in the industry (see Figure 1.3 and Table 1.6). In two other counties, the life sciences share exceeded the state average of 2.8%: Salt Lake County at 4.1% and Weber County at 3.2%.[8] With 32,285 jobs, Salt Lake County had the highest life sciences industry employment of any county, followed by Utah County with its 5,284 jobs.

The average wage per life sciences industry job was much higher than the average wage in other industries in Utah. Thus, wages reflect more fully than employment alone the effect of the life sciences industry on employees' household finances and the broader economy when workers spend their incomes in Utah communities. Like jobs, employee wages are reported by place of work, not residence, for people who commute across county lines. Wages do not include employer-paid benefits. County wage data were available for 12 of the 23 counties with life sciences employment due to disclosure limitations for 11 counties with fewer than three life sciences establishments each.[9]

In 11 of the 12 counties with three or more life sciences establishments in 2022, the industry contributed a larger share of county employee wages than its share of county employment

Table 1.4: Utah Life Sciences Company Size, 2022

	Establishment Count		Share of Total	
Employment	Life Sciences	Other Industries	Life Sciences	Other Industries
2,000 to 14,999	2	26	0.1%	0.0%
1,000 to 1,999	6	53	0.4%	0.1%
500 to 999	12	146	0.7%	0.1%
250 to 499	20	425	1.2%	0.4%
100 to 249	36	1,670	2.2%	1.6%
50 to 99	61	3,402	3.7%	3.2%
20 to 49	135	9,182	8.3%	8.8%
10 to 19	127	12,747	7.8%	12.2%
5 to 9	190	17,062	11.6%	16.3%
1 to 4	1,045	60,136	64.0%	57.4%
Total	**1,634**	**104,849**	**100.0%**	**100.0%**

Note: Companies may have more than one establishment (worksite), explaining why establishment counts in Table 1.4 don't reconcile to number of rows in Table 1.5 for each employment category. Table 1.4 does not include proprietors with only self-employed workers or other companies without employees.
Source: Kem C. Gardner Policy Institute analysis of data that companies provided to the Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Firm Find

Table 1.5: Largest Employers in Utah's Life Sciences Industry, 2022

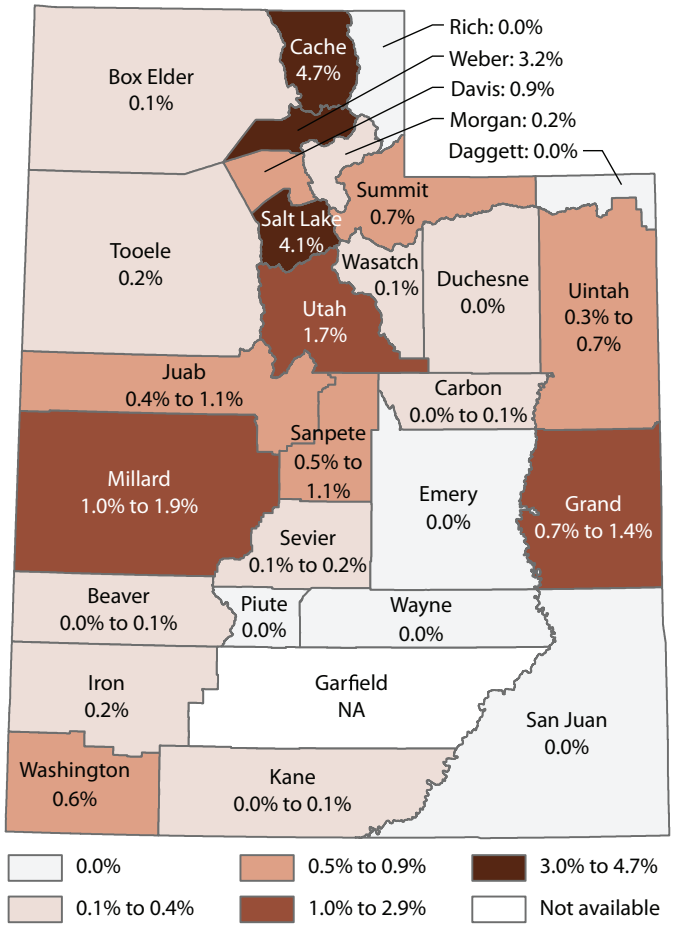
(Companies with More Than 500 In-State Jobs)

Company[1]	Segment[2]	Employment[3]
ARUP Laboratories	Research, Testing, and Medical Labs	3,920 to 5,848
Merit Medical	Medical Devices and Diagnostics	2,000 to 2,999
bioMérieux[4]	Research, Testing, and Medical Labs	1,650 to 3,442
BD[5]	Medical Devices and Diagnostics	1,300 to 2,597
Fresenius[6]	Medical Devices and Diagnostics	1,073 to 2,148
Thermo Fisher	Medical Devices and Diagnostics	1,041 to 2,101
Nu Skin	Biosciences-Related Distribution	1,010 to 2,016
Edwards Lifesciences	Medical Devices and Diagnostics	1,000 to 1,999
Ultradent	Medical Devices and Diagnostics	1,000 to 1,999
Varex Imaging	Medical Devices and Diagnostics	1,000 to 1,999
Myriad Genetics	Research, Testing, and Medical Labs	760 to 1,517
1-800 Contacts	Biosciences-Related Distribution	750 to 1,498
Stryker	Medical Devices and Diagnostics	575 to 1,156
Sotera Health[8]	Research, Testing, and Medical Labs	525 to 1,057
ICU Medical	Medical Devices and Diagnostics	501 to 1,003

Notes:
1. Job counts were combined for any company aliases and worksites within the life sciences industry.
2. Descriptions are for the NAICS industry in which the company had the most jobs.
3. Company-reported employment was averaged from monthly job counts for full- or part-time employee positions (no self-employment). Federal disclosure guidelines permit broad employment ranges, not exact counts. Nine additional life sciences companies may have more than 500 Utah jobs, but their ranges are inconclusive: Capstone Nutrition, Cytiva, Nutraceutical Corporation, and USANA, each with 500 to 999 jobs; Teva Pharmaceutical with 416 to 879 jobs; Reckitt with 301 to 602 jobs; GE HealthCare with 270 to 548 jobs; ICON with 260 to 518 jobs; and Biomerics with 251 to 503 jobs.
4. BioMérieux is the parent company of BioFire Diagnostics and BioFire Defense.
5. BD is the trade name of Becton, Dickinson and Company.
6. The Fresenius employment range does not include worksite locations primarily for patient care.
7. Thermo Fisher Scientific includes Invitrogen.
8. Sotera Health includes business units Nelson Labs and Sterigenics.

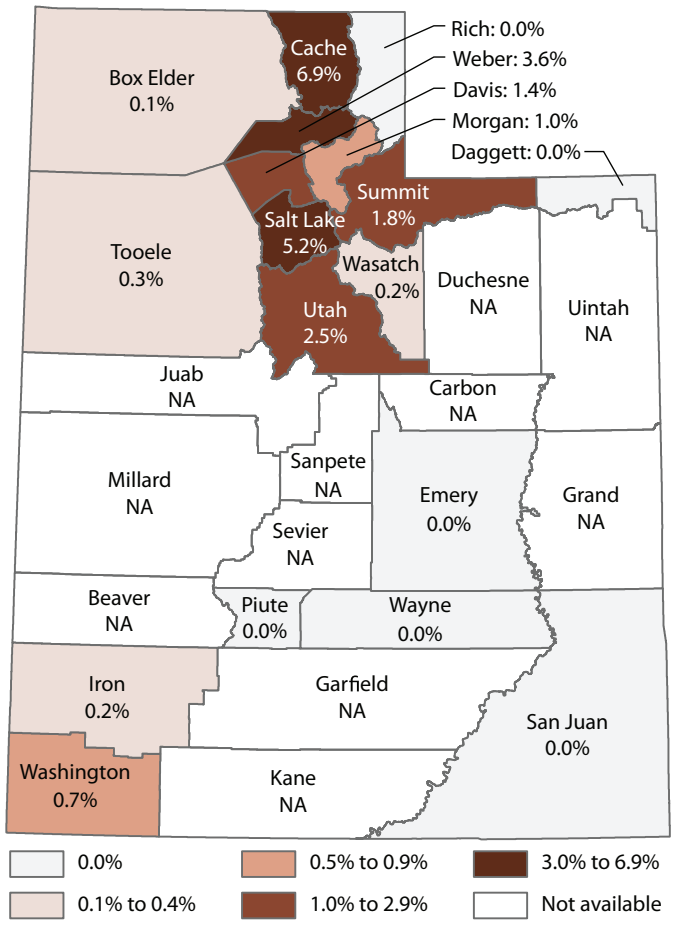
Source: Kem C. Gardner Policy Institute analysis of data companies provided for the Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Firm Find

Figure 1.3 Life Sciences Share of County Employment, 2022
(Share of County Employment in All Industries)



Note: Map does not include self-employment. Employment ranges describe employment in counties with fewer than three life sciences establishments and resulting disclosure limitations. Nonzero lower bounds rounded to zero for several counties' ranges: Beaver, 0.03% to 0.14%; Carbon, 0.02% to 0.09%; Duchesne, 0.01% to 0.05%; and Kane, 0.02% to 0.10%. Garfield County's employment range was not available, but there was one establishment. Daggett, Emery, Piute, Rich, San Juan, and Wayne counties did not have life sciences companies with employee jobs in 2022.
Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Utah Economic Data Viewer and personal communication; State of Utah, State Geographic Information Database

Figure 1.4: Life Sciences Share of County Wages, 2022
(Millions of Dollars)



NA = not available (wages not disclosed for counties with fewer than three life sciences establishments)
Note: Map does not include proprietor's income from self-employment. Six counties did not have life sciences companies with employees: Daggett, Emery, Piute, Rich, San Juan, and Wayne.
Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Utah Economic Data Viewer and personal communication; State of Utah, State Geographic Information Database

(see Figure 1.4).[10] For example, the life sciences industry paid 6.9% of all wages in Cache County, over two percentage points higher than the industry's 4.7% job share there. Workers in Salt Lake County's more diversified economy still earned 5.2% of their wages from life sciences companies, 1.1 percentage points above the industry's job share in the county.

Life sciences industry workers in Salt Lake County received nearly $2.9 billion in 2022 employee wages, 72.9% of the industry's statewide total (see Table 1.7). With over $0.4 billion, Utah County had the second-most wages, 10.9% of all life sciences wages in the state. In three other counties, the life sciences industry provided more than $100 million in wages. Workers in the remaining counties together brought in 2.2% of Utah's life sciences industry wages.

The Utah Department of Workforce Services provides sub-county location details for establishments representing at least 85.1% of Utah life sciences employment in 2022, not including self-employment. Based on that coverage, life sciences companies operated in at least 94 cities and towns across urban and rural Utah (see Figure 1.5).

In 2022, 22 Utah municipalities had at least 10 establishments in the life sciences industry (see Table 1.8). Eight of these municipalities were in Salt Lake County, seven were in Utah County, and three were in Davis County. Four other counties—Cache, Summit, Washington, and Weber—had one city with at least 10 life sciences establishments. Another eight municipalities had 5 to 9 establishments, and 65 municipalities had 1 to 4 establishments.[11]

Table 1.6: Life Sciences Employment by County, 2022

County	Jobs[1]	County Share of Life Sciences Total[2]	Life Sciences Share of Total County Employment[3]
Box Elder	22	0.0%	0.1%
Cache	3,207	6.8%	4.7%
Davis	1,243	2.6%	0.9%
Iron	53	0.1%	0.2%
Morgan	6	0.0%	0.2%
Salt Lake	32,285	68.7%	4.1%
Summit	213	0.5%	0.7%
Tooele	45	0.1%	0.2%
Utah	5,284	11.2%	1.7%
Wasatch	12	0.0%	0.1%
Washington	517	1.1%	0.6%
Weber	3,801	8.1%	3.2%
Other[4]	338	0.7%	0.4%
Total[5]	**47,026**	**100.0%**	**2.8%**

Notes:
1. Self-employment jobs not included.
2. Nonzero shares of life sciences employment totals rounded to zero for three counties: Box Elder, 0.05%; Morgan, 0.01%; and Wasatch, 0.03%.
3. The second share equals life sciences employment divided by total employment from all industries in the county.
4. Other counties include Beaver, Carbon, Duchesne, Garfield, Grand, Juab, Kane, Millard, Sanpete, Sevier, and Uintah, which have fewer than three life sciences establishments each.
5. The county total of 47,026 jobs statewide here is 0.1% lower than the segment total of 47,064 jobs statewide in Table 1.3 due to data query differences involving a few employer establishments with mid-year industry reclassifications.

Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Utah Economic Data Viewer and personal communication

Table 1.7: Life Sciences Wages by County, 2022

(Millions of Dollars)

County	Wages[1]	County Share of Life Sciences Total[2]	Life Sciences Share of Total County Wages[3]
Box Elder	$1.7	0.0%	0.1%
Cache	$212.3	5.4%	6.9%
Davis	$108.5	2.8%	1.4%
Iron	$1.8	0.0%	0.2%
Morgan	$1.5	0.0%	1.0%
Salt Lake	$2,852.2	72.9%	5.2%
Summit	$33.6	0.9%	1.8%
Tooele	$2.8	0.1%	0.3%
Utah	$426.3	10.9%	2.5%
Wasatch	$1.1	0.0%	0.2%
Washington	$26.5	0.7%	0.7%
Weber	$228.5	5.8%	3.6%
Other[4]	$17.5	0.4%	0.4%
Total	**$3,914.2**	**100.0%**	**3.8%**

Notes:
1. Employer-paid benefits and proprietors' income not included.
2. Nonzero shares of life sciences wage totals rounded to zero for four counties: Box Elder, 0.04%; Iron, 0.05%; Morgan, 0.04%; and Wasatch, 0.03%.
3. The second share equals life sciences wages divided by total wages from all industries in the county.
4. Other counties include Beaver, Carbon, Duchesne, Garfield, Grand, Juab, Kane, Millard, Sanpete, Sevier, and Uintah, which have fewer than three life sciences establishments each.

Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Utah Economic Data Viewer and personal communication

Table 1.8: Utah Life Sciences Companies by City, 2022

(Municipalities with at Least 10 Establishments)

Municipality	Life Sciences Establishments	Share of Establishments in All Industries
Salt Lake City	361	2.0%
Ogden	54	1.3%
Sandy	51	1.3%
Draper	49	2.1%
Provo	39	1.5%
Saint George	38	0.9%
Park City	35	1.6%
Orem	34	1.1%
Lehi	33	1.4%
South Jordan	32	1.5%
Logan	26	1.2%
Layton	22	1.1%
Midvale	19	1.3%
Bountiful	18	1.3%
West Valley City	17	1.2%
Lindon	16	2.4%
Murray	16	1.3%
American Fork	16	1.2%
West Jordan	14	0.6%
Spanish Fork	14	1.1%
Kaysville	11	1.6%
Pleasant Grove	11	1.1%

Note: Shares equal the number of life sciences establishments divided by the total establishment count for all industries in the municipality. Companies may have more than one establishment (worksite). The table does not include proprietors with only self-employed workers or other companies without employees.

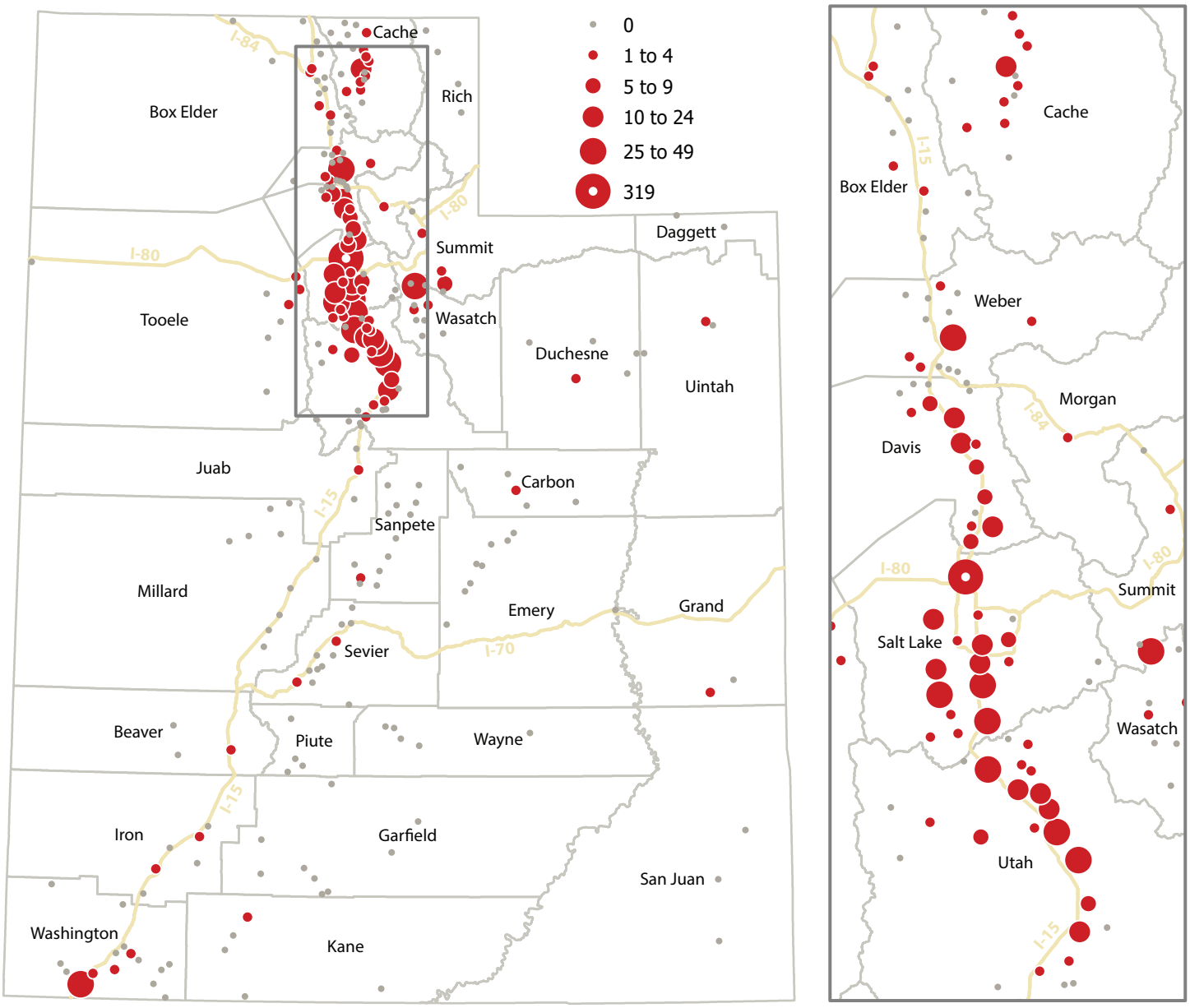
Source: Kem C. Gardner Policy Institute analysis of data companies provided for the Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Firm Find

Salt Lake City had the most life sciences establishments with 319 distinct company locations. Draper, Ogden, and Sandy each had between 40 and 50 establishments. In Draper, Lindon, and Salt Lake City, life sciences companies operated at least 2.0% of all establishments in any industry. Since life sciences establishments are larger on average than establishments in other industries, municipal employment shares may be several times greater than establishment shares, but municipal-level employment data are limited.

In-State and Out-of-State Sales

The life sciences industry in Utah produced $14.2 billion in output in 2022 (see Table 1.9). Output represents the sales value of goods and services and is, appropriately, much larger than the industry's GDP of $8.0 billion. GDP measures value added by life sciences companies and adjusts sales by the cost of intermediate inputs to avoid double counting. Life sciences goods and services were sold in Utah and outside the state, both of which generated economic impacts in Utah.

Figure 1.5: Life Sciences Company Locations in Utah, 2022
(Number of Establishments in Each Municipality)



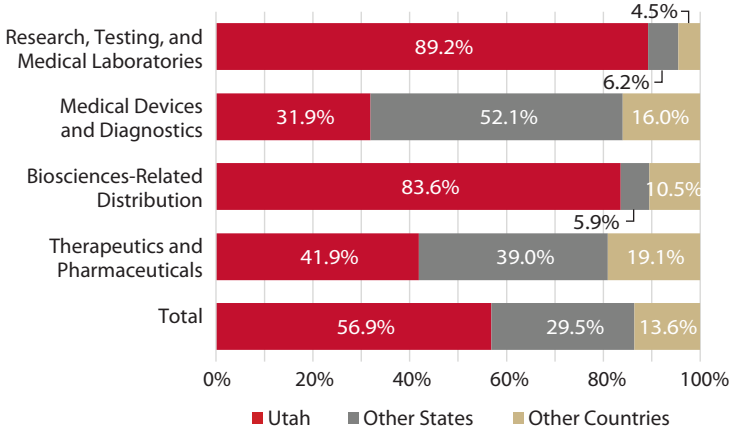
Note: A company may have more than one establishment (worksite). The map does not include proprietors with only self-employed workers or other companies without employees. The city or town is available for 1,006 of Utah's 1,632 life sciences establishments with employees. These 1,006 establishments provided at least 85.1% of the industry's employee jobs. Missing from the map are four census-designated places (Dugway, Eden, Liberty, and Mountain Green), two unincorporated communities (Abraham and Beaver Dam), a metro township (Kearns), and a military base (Hill Air Force Base), each with one to four life sciences establishments.
Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Firm Find; State of Utah, State Geographic Information Database.

Table 1.9: Utah Life Sciences Industry Direct Output by Destination, 2022
(Millions of Dollars)

Industry Segment	Utah	Other States	Other Countries	Total
Research, Testing, and Medical Laboratories	$2,231.6	$156.2	$112.8	$2,500.5
Medical Devices and Diagnostics	$1,400.3	$2,286.6	$700.3	$4,387.2
Biosciences-Related Distribution	$2,775.2	$194.2	$349.5	$3,318.9
Therapeutics and Pharmaceuticals	$1,666.0	$1,551.6	$759.4	$3,977.0
Total	**$8,073.0**	**$4,188.6**	**$1,921.9**	**$14,183.5**

Note: Output is equivalent to total sales. Amounts in the table are estimates based on weighted averages from sales destination shares for each industry to which life sciences companies in each segment belong.
Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, personal communication; U.S. Bureau of Economic Analysis, Regional Data, Annual Personal Income and Employment by State; and REMI PI+ economic model

Figure 1.6: Utah Life Sciences Industry Components, Share of Output Sold by Destination, 2022



Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, personal communication; U.S. Bureau of Economic Analysis, Regional Data, Annual Personal Income and Employment by State; and REMI PI+ economic model

We estimated the amount of Utah life sciences output sold in-state, in other states, and outside the country from industry averages in 2022. More than half (56.9%) of total output from Utah's life sciences industry was provided to in-state customers, 29.5% went to other states, and 13.6% was exported to other countries (see Figure 1.6). Total sales from Utah to other states or countries amounted to an estimated $6.1 billion. This out-of-state company revenue, once it entered Utah's economy, benefited workers and companies in and beyond the state's life sciences industry.

Medical devices and diagnostics accounted for nearly half of life sciences sales outside Utah in 2022, $3.0 billion (see Table 1.9). Therapeutics and pharmaceuticals accounted for over one-third of life sciences sales outside the state, $2.3 billion. Sales by these two industry segments represent direct sales from manufacturers. Another $0.5 billion in revenue came into the state from Utah wholesalers (biosciences-related distribution) selling life sciences products to out-of-state customers. The remaining $0.3 billion was for research, testing, and medical laboratory services provided to customers in states or countries outside Utah.

Utah's life sciences industry also provides goods and services needed by Utah health care providers, pharmacies, and other in-state buyers. Nearly 60% of output from Utah's life sciences industry was sold in-state. Were it not for these sales, an estimated $8.1 billion would leave the state as other states and countries satisfied Utah demand for life sciences products. Biosciences-related distribution accounted for 34% and research, testing, and medical laboratories accounted for 28% of total in-state life sciences sales. Utah buyers purchased over 80% of these products and services, worth a combined $5.0 billion. In contrast, less than one-third of goods manufactured by Utah medical devices and diagnostics companies and less than half of goods manufactured by drug and pharmaceutical companies stayed in-state, accounting for a combined $3.1 billion in sales.

Workforce Demographics

Workforce demographics described below shows race, ethnicity, and sex shares among workers in the life sciences industry and (Science, Technology, Engineering, and Math) STEM workers. STEM workers play an important role in the life sciences industry filling many advanced roles. In terms of sex, race, and ethnicity, Utah's life sciences industry as a whole has a more diverse workforce than Utah's STEM workforce.

Life Sciences Industry

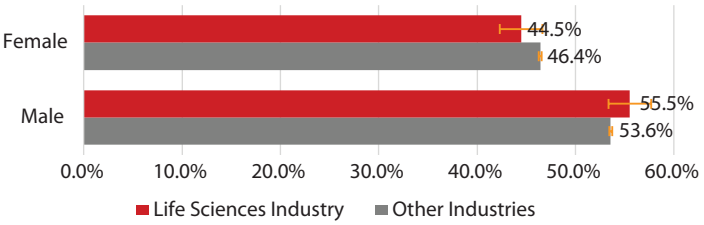
In Utah, workers in the life sciences industry are more racially and ethnically diverse than workers in other industries and a similar share of women work in life sciences when compared to other industries. Nationally, the life sciences industry employed similar shares of minority and female workers when compared to other industries. These findings represent employees and self-employed workers categorized based on the industry of the company where they work, regardless of their occupations.

Both in Utah and nationally, the share of women working in the life sciences industry is similar to the share of women working in other industries. From 2017 to 2021, 44.5% of life sciences employees were female compared to 46.4% of employees in other industries (see Figure 1.7). Nationally, 48.7% of life sciences employees were female, compared to 48.3% in other industries (see Figure 1.8).

The life sciences industry in Utah employs a larger share of people of color when compared to all other industries. From 2017 to 2021, 28.2% of life sciences workers identified as a minority (non-White) race or ethnicity compared to 21.4% in all other industries. Those who identified as Hispanic or Latino, some other race, or Asian were overrepresented in the life sciences industry when compared to other industries while the other racial/ethnic shares were more similar when compared to shares in other industries (see Figure 1.9). Nationally, the life sciences industry employed a similar share of minority workers (37.6%) when compared to all other industries (38.2%). While Asian workers were overrepresented in the life sciences industry, all other minority populations were underrepresented except Native Hawaiian or Other Pacific Islander who held the same share (0.2%) in both life sciences and other industries (see Figure 1.10).

Figure 1.7: Utah Share of Life Sciences and Other Workers by Sex, 2017–2021

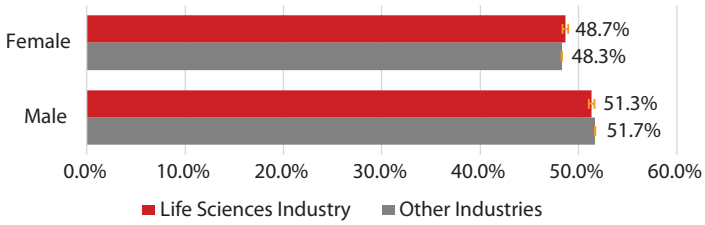
(Share of Adult Workers in Industry Category)



Note: Shares include people ages 18 years and above, not living in group quarters, with employee or self-employed jobs in the previous five years. Markers at the end of each bar indicate a 90% confidence interval based on a systematic Utah sample of 88,959 adults, among them 2,906 life sciences workers.
Source: U.S. Census Bureau, American Community Survey, Integrated Public Use Microdata Series

Figure 1.8: U.S. Share of Life Sciences and Other Workers by Sex, 2017–2021

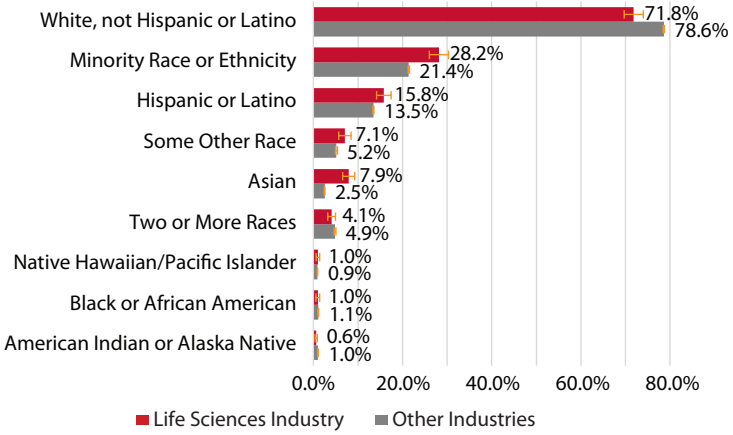
(Share of Adult Workers in Industry Category)



Note: Shares include people ages 18 years and above, not living in group quarters, with employee or self-employed jobs in the previous five years. Markers at the end of each bar indicate a 90% confidence interval based on a systematic U.S. sample.
Source: U.S. Census Bureau, American Community Survey, Integrated Public Use Microdata Series

Figure 1.9: Utah Share of Life Sciences and Other Workers by Race/Ethnicity in Utah, 2017–2021

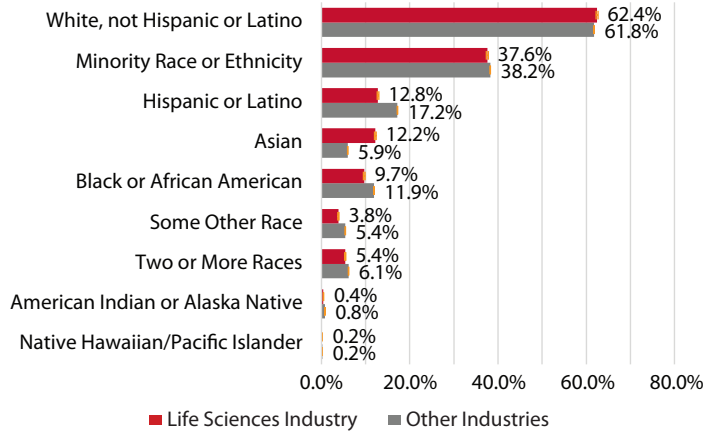
(Share of Adult Workers in Industry Category)



Note: Shares include people ages 18 years and above, not living in group quarters, with employee or self-employed jobs in the previous five years. Minority shares represent people who are Hispanic or Latino, or identify as any race other than White. Hispanic or Latino ethnicity includes persons of Hispanic, Latino, or Spanish origin, regardless of their race. Hispanic or Latino persons are not counted in the mutually exclusive race groups. All race groups except two or more races are limited to people claiming only one racial identity. Markers at the end of each bar indicate a 90% confidence interval based on a systematic Utah sample of 88,959 adults, among them 2,906 life sciences workers.
Source: U.S. Census Bureau, American Community Survey, Integrated Public Use Microdata Series

Figure 1.10: U.S. Share of Life Sciences and Other Workers by Race/Ethnicity in Utah, 2017–2021

(Share of Adult Workers in Industry Category)



Note: Shares include people ages 18 years and above, not living in group quarters, with employee or self-employed jobs in the previous five years. Minority shares represent people who are Hispanic or Latino, or identify as any race other than White. Hispanic or Latino ethnicity includes persons of Hispanic, Latino, or Spanish origin, regardless of their race. Hispanic persons are not counted in the mutually exclusive race groups. All race groups except two or more races are limited to people claiming only one racial identity. Markers at the end of each bar indicate a 90% confidence interval based on a systematic U.S. sample.
Source: U.S. Census Bureau, American Community Survey, Integrated Public Use Microdata Series

STEM Occupations

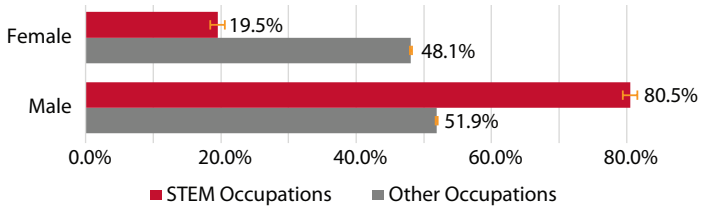
Utah's life sciences industry relies on STEM talent to fill many advanced roles. STEM occupations make up approximately 15.0% of life sciences employment in Utah.[12] STEM employment does not fully match the racial, ethnic, and gender diversity of the population working in the state and appears less diverse than life sciences employment as a whole. This section describes characteristics of people in science, technology, engineering, and mathematics occupations, whether at life sciences companies or in other industries.

Participation in the STEM workforce varies by sex. From 2017 to 2021, 19.5% of STEM workers in Utah were female compared 48.1% of workers in all other industries (see Figure 1.11). Nationally, the share of female STEM workers was higher at 25.3% compared to 49.6% in all other industries (see Figure 1.12).

Utah and other states have experienced racial and ethnic disparities in STEM occupations. From 2017 to 2021, an average of 17.5% of Utah's STEM workers identified as a racial or ethnic minority compared to 21.8% in other industries (see Figure 1.13). Nationwide, 35.9% of STEM workers identified as a racial/ethnic minority compared to 38.4% in other industries (see Figure 1.14). While White and Asian workers are overrepresented in STEM occupations, all other racial and ethnic groups are underrepresented both in Utah and the U.S.

Figure 1.11: Utah Share of STEM and Other Workers by Sex in Utah, 2017–2021

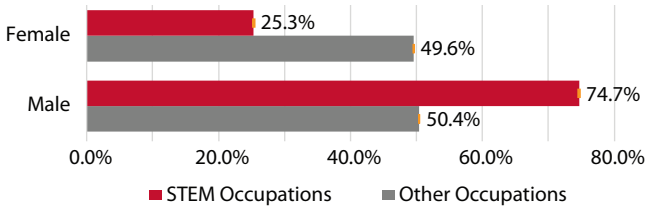
(Share of Adult Workers in Occupation Category)



STEM = Science, Technology, Engineering, and Mathematics
Note: Shares include people ages 18 years and above, not living in group quarters, with employee or self-employed jobs in the previous five years. Markers at the end of each bar indicate a 90% confidence interval based on a systematic Utah sample of 86,378 adults, among them 5,500 STEM workers.
Source: U.S. Census Bureau, American Community Survey, Integrated Public Use Microdata Series; U.S. Bureau of Labor Statistics definition of STEM occupations

Figure 1.12: U.S. Share of STEM and Other Workers by Sex in Utah, 2017–2021

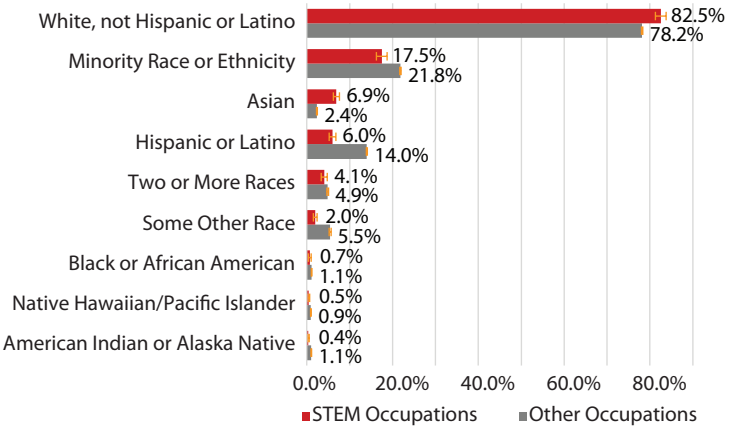
(Share of Adult Workers in Occupation Category)



STEM = Science, Technology, Engineering, and Mathematics
Note: Shares include people ages 18 years and above, not living in group quarters, with employee or self-employed jobs in the previous five years. Markers at the end of each bar indicate a 90% confidence interval based on a systematic U.S. sample.
Source: U.S. Census Bureau, American Community Survey, Integrated Public Use Microdata Series; U.S. Bureau of Labor Statistics definition of STEM occupations

Figure 1.13: Utah Share of STEM and Other Workers by Race/Ethnicity in Utah, 2017–2021

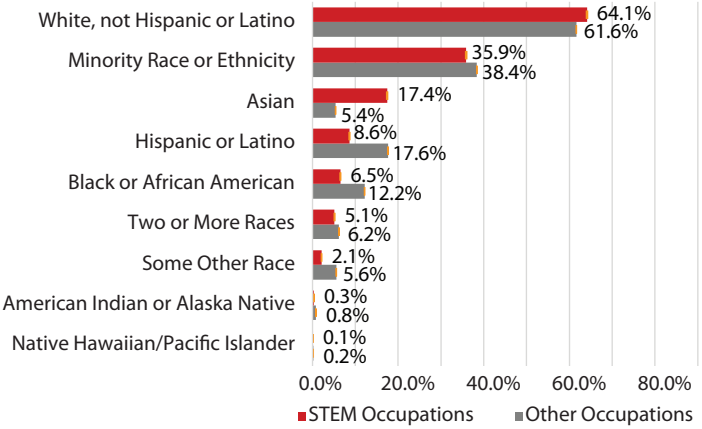
(Share of Adult Workers in Occupation Category)



STEM = Science, Technology, Engineering, and Mathematics
Note: Shares include people ages 18 years and above, not living in group quarters, with employee or self-employed jobs in the previous five years. Minority shares represent people who are Hispanic or Latino, or identify as any race other than White. Hispanic or Latino ethnicity includes persons of Hispanic, Latino, or Spanish origin, regardless of their race. Hispanic persons are not counted in the mutually exclusive race groups. All race groups except two or more races are limited to people claiming only one racial identity. Markers at the end of each bar indicate a 90% confidence interval based on a systematic Utah sample of 86,378 adults, among them 5,500 STEM workers.
Source: U.S. Census Bureau, American Community Survey, Integrated Public Use Microdata Series; U.S. Bureau of Labor Statistics definition of STEM occupations

Figure 1.14: U.S. Share of STEM and Other Workers by Race/Ethnicity in Utah, 2017–2021

(Share of Adult Workers in Occupation Category)



STEM = Science, Technology, Engineering, and Mathematics
Note: Shares include people ages 18 years and above, not living in group quarters, with employee or self-employed jobs in the previous five years. Minority shares represent people who are Hispanic or Latino, or identify as any race other than White. Hispanic or Latino ethnicity includes persons of Hispanic, Latino, or Spanish origin, regardless of their race. Hispanic persons are not counted in the mutually exclusive race groups. All race groups except two or more races are limited to people claiming only one racial identity. Markers at the end of each bar indicate a 90% confidence interval based on a systematic U.S. sample.
Source: U.S. Census Bureau, American Community Survey, Integrated Public Use Microdata Series; U.S. Bureau of Labor Statistics definition of STEM occupations

Section 2. Economic and Fiscal Impacts

Utah's life sciences and health care innovation (life sciences) industry affects other industries in the state. To this point, we have focused on economic activity within the life sciences industry. Now we will add economic activity it supports in other industries, informed by the counterfactual, "What would Utah's economy look like without its life sciences industry?" We estimate its total economic impacts in 2022, which include direct, indirect, and induced effects along with associated fiscal impacts.

Since we are evaluating the contributions of the entire industry, all life sciences activity can be considered an economic impact in one of two ways. First, out-of-state sales bring outside money into Utah's economy. Second, in-state sales are a direct substitute for Utah buyers of life sciences goods and services who would otherwise purchase them from outside the state. Therefore, in-state sales prevent a loss of resources from the state's economy. For these reasons, the life sciences industry's economic impact is approximately equal to its economic contribution in Utah. See Section 5 under Economic and Fiscal Impacts for more information.

Economic Impacts

Economic impact results include direct economic activity described in Section 1, as well as indirect and induced activity generated from purchases by life sciences companies and workers. Spending by life sciences companies on both purchases and employee personal income sustained companies and workers throughout Utah's economy. Indirect economic activity results from spending by the in-state companies from whom life sciences companies purchase goods and services. Induced economic activity results from the personal spending by workers at life sciences companies and at other companies that help provide goods and services to life sciences companies. See Section 5 under Economic and Fiscal Impacts for more information.

In 2022, total economic impacts in Utah from life sciences companies were 182,383 jobs, $14.6 billion in earnings (employee and self-employed earnings, including wages and benefits), and $21.6 billion in GDP (see Figure 2.1). These estimates of combined direct, indirect, and induced impacts measured 7.7% of Utah employment, 9.5% of its earnings, and 8.5% of its GDP in 2022.[13] For example, 9.5% percent of all earnings in Utah came either from life sciences companies or from companies in other industries that were supported by purchases by life sciences companies and workers.

Direct, indirect, and induced impacts of the life sciences industry vary across industry sectors. The three industries with the largest employment economic impact from the life

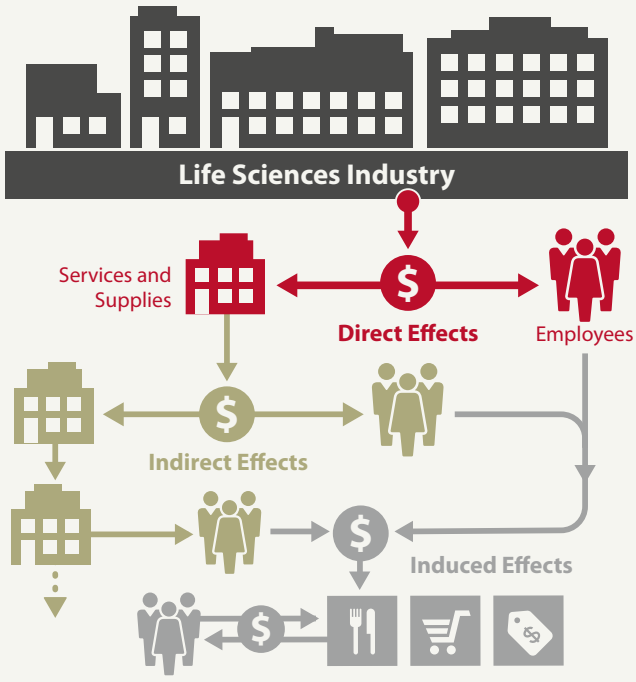
Economic and Fiscal Impact Concepts

Economic impacts refer to the economic activity in a geographic region generated by a given source—in this case, the life sciences industry.

The Gardner Institute estimated four components:

- **Direct impacts**, which involve employee compensation and other spending by companies in Utah's life sciences industry;
- **Indirect impacts**, which include the relevant portion of spending at companies that provide inputs to companies in the life sciences industry;
- **Induced impacts**, which include the household spending of life sciences industry employees and self-employed workers, as well as the relevant portion of spending by workers at companies that are part of the indirect impacts; and
- **Fiscal impacts**, which include tax revenue and government expenditures associated with direct, indirect, and induced impacts.

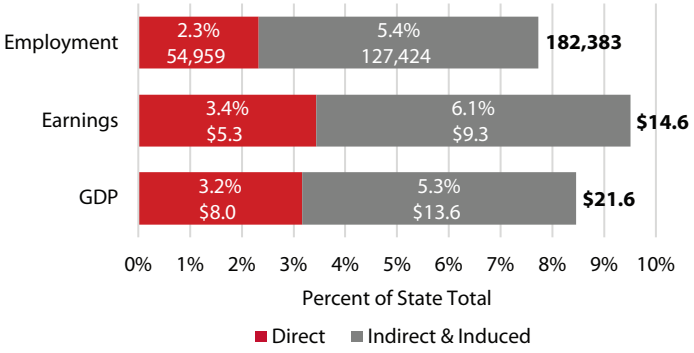
Economic Flow of Direct, Indirect, and Induced Economic Impacts



Source: Kem C. Gardner Policy Institute

Figure 2.1: Life Sciences Industry Economic Impacts in Utah, 2022

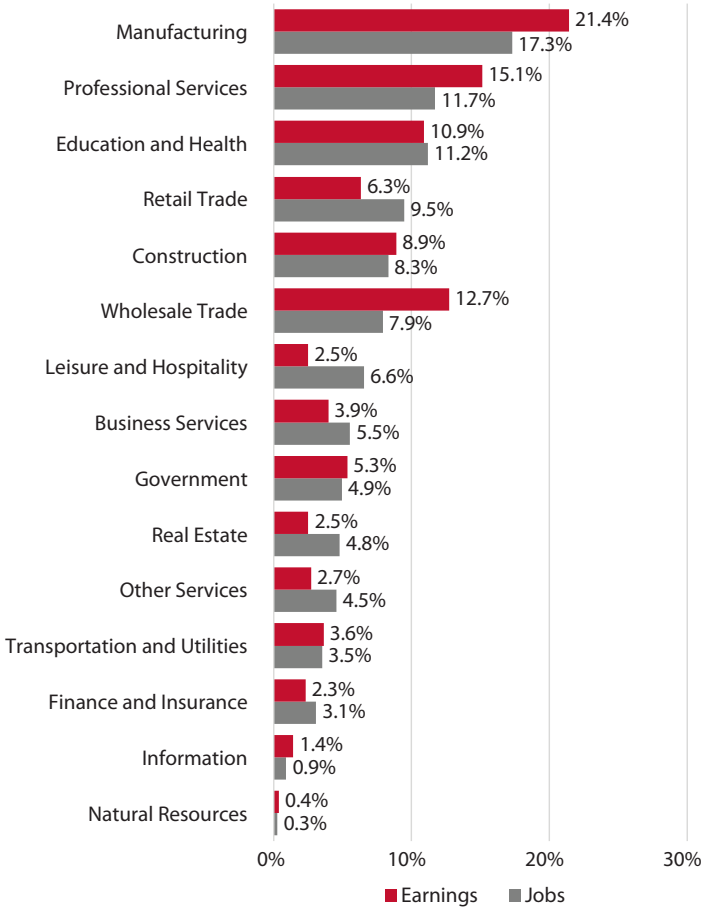
(Jobs; Billions of Dollars)



Note: Employment includes full-time and part-time jobs for employee and self-employed workers. Percentages equal economic impacts divided by total employment, earnings, and GDP in the state. Utah industries, including life sciences, are interdependent and have overlapping economic impacts. Statewide measures of direct economic activity in all industries would add to 100%.

Source: Kem C. Gardner Policy Institute analysis of data from the Utah Department of Workforce Services and Bureau of Economic Analysis using REMI PI+ economic model

Figure 2.2: Life Sciences Industry Direct, Indirect, and Induced Share of Total Employment and Earnings by Industry, 2022



Source: Kem C. Gardner Policy Institute analysis of data from the Utah Department of Workforce Services and U.S. Bureau of Economic Analysis using REMI PI+ economic model.

sciences industry in 2022 were manufacturing, professional services, and education and health which combined to more than a third of the 182,383 direct, indirect, and induced job total (see Figure 2.2).[14] The life sciences industry directly created or supported 32,354 manufacturing jobs, 21,421 professional services jobs, and 20,271 education and health jobs in Utah. Five other industries gained more than 10,000 Utah jobs each in 2022 because of the life sciences industry including retail trade, construction, wholesale trade, leisure & hospitality, and business services. The remaining seven industries collectively received 21.9% of the employment impacts (see Table 2.1).

Table 2.1: Life Sciences Industry Direct, Indirect, and Induced Economic Impacts by Industry Sector, 2022

Industry Sector	Employment			Earnings		
	Jobs	Share of Total	Share of Sector	$ Millions	Share of Total	Share of Sector
Manufacturing	32,354	17.7%	18.9%	$3,129	21.4%	21.4%
Professional Services	21,421	11.7%	11.1%	$2,209	15.1%	13.9%
Wholesale Trade	14,445	7.9%	21.3%	$1,859	12.7%	26.1%
Education and Health	20,271	11.1%	7.3%	$1,594	10.9%	9.7%
Construction	15,022	8.2%	9.4%	$1,299	8.9%	10.0%
Retail Trade	17,113	9.4%	7.0%	$925	6.3%	7.7%
Government	8,930	4.9%	3.2%	$779	5.3%	3.6%
Business Services	10,022	5.5%	6.1%	$577	3.9%	6.1%
Transportation and Utilities	6,361	3.5%	6.1%	$529	3.6%	6.5%
Other Services	8,224	4.5%	7.0%	$393	2.7%	6.4%
Real Estate	8,663	4.7%	6.7%	$368	2.5%	6.6%
Leisure and Hospitality	11,873	6.5%	5.7%	$365	2.5%	6.3%
Finance and Insurance	5,566	3.1%	3.7%	$337	2.3%	3.6%
Information	1,648	0.9%	3.4%	$208	1.4%	3.6%
Natural Resources	470	0.3%	1.2%	$53	0.4%	2.5%
Total	**182,383**	**100.0%**	**7.7%**	**$14,623**	**100.0%**	**9.5%**

Source: Kem C. Gardner Institute analysis of data from the Utah Department of Workforce Services and U.S. Bureau of Economic Analysis using REMI PI+ economic model.

Measuring direct, indirect, and induced earnings is another measure of economic impacts from the life sciences industry. Manufacturing and retail services were the industries with the largest earnings impacts at $3.2 million and $2.2 million, respectively. Wholesale trade, education & health, and construction all had impacts of over $1.0 billion. These five industries accounted for nearly 70% of direct, indirect, and induced earnings. The remaining 31.0% was spread across the remaining ten industries.

Fiscal Impacts

The total economic impacts presented resulted in additional tax revenue and government expenditures in Utah. Life sciences companies' operations in 2022 supported a net positive fiscal impact to state and local government of $542.1 million (see Table 2.2). This includes $1,237.9 million in tax revenues paid or indirectly generated, less $695.7 million in additional demand for state, county, city/town, and school district expenditures. See Section 5 under Economic and Fiscal Impacts for more information about the fiscal impact analysis methodology.

The net fiscal impact resulting from activity in the life sciences industry alone was $268.9 million. That includes taxes paid by workers and companies in the industry. Most fiscal impacts—61.3% of revenues and 69.9% of government expenditures—came from indirect and induced effects of the life sciences industry. While the life sciences industry's direct fiscal impact is significant, the industry supports larger tax revenue flows and requires more government expenditures through companies and workers that are part of its indirect and induced economic impacts in Utah.

At the state level, most of the $761.0 million in estimated 2022 tax revenue associated with the life sciences industry's economic impact came from sales and personal income taxes (see Table 2.3). The state portion of additional sales tax revenue was $350.8 million. Personal income taxes of $354.3 million were paid by employees and proprietors in Utah's life sciences industry and by workers in other industries supported by life sciences company and worker spending. Corporate income taxes paid by life sciences companies and other companies they support were estimated at $55.8 million.

Government expenditures help support the population of adults and children living in Utah and working in the life sciences industry or in a job in another industry indirectly supported by the life sciences industry. We estimated the share of state government operating expenses in 2022 that can be attributed to the life sciences industry at $369.0 million. Public and higher education operating expenditures, nearly half the total, combined to $178.4 million. Non-education operating expenditures amounted to $190.6 million. The estimated state capital expenditures that can be attributed to the life sciences industry total $46.2 million for 2022, with non-education capital expenditures accounting for the largest amount ($41.2 million). Subtracting total state operating expenses and state capital expenditures from total state revenues yields net state revenue from the life sciences industry of $345.8 million.

We separated total state revenues and expenditures into the portions associated with direct and with indirect and induced economic impacts of the life sciences industry. Direct economic impacts accounted for $176.6 million, which was an estimated 51.1% of the additional net state government revenue from the life sciences industry in 2022. The industry's indirect and induced effects generated just under half of state net tax revenues ($169.2 million of $345.8 million).

Turning to local government, the net fiscal impact of Utah's life sciences industry was estimated at $196.3 million in 2022 (see Table 2.4). That includes an estimated $476.9 million in tax revenues and $280.5 million in operating and capital expenditures for counties, cities/towns, and school districts. Most local tax revenues came from the property tax ($332.5 million). The local portion of sales tax collections was $144.4 million. Expenditures for counties and cities/towns, including public K–12 education, amounted to $280.5 million.

As with state fiscal impacts, these local revenues and expenditures are associated with direct, indirect, and induced economic impacts of the life sciences industry. Direct economic impacts accounted for $92.3 million, which was 47.0% percent of the net local government revenue resulting from the life sciences industry during 2022. The industry's indirect and induced effects generated 53.0% of estimated local net tax revenues ($104.0 million of $196.3 million).

Table 2.2: Utah Life Sciences Industry State and Local Fiscal Impacts, 2022
(Millions of Dollars)

Impact	Direct	Indirect & Induced	Total
Tax Revenues	$478.5	$759.4	$1,237.9
Government Expenditures	$209.7	$486.0	$695.7
Net State and Local Revenue	**$268.9**	**$273.2**	**$542.1**

Source: Kem C. Gardner Policy Institute fiscal model

Table 2.3: Life Sciences Industry State Fiscal Impacts in Utah, 2022
(Millions of Dollars)

Impact	Direct	Indirect & Induced	Total
State Sales Tax Revenues	$136.7	$214.1	$350.8
Personal Income Tax Revenues	$138.1	$216.2	$354.3
Corporate Income Tax Revenues	$27.0	$28.8	$55.8
Total State Tax Revenues	**$301.7**	**$459.3**	**$761.0**
Non-Education Expenditures	$57.4	$133.2	$190.6
Public Education Expenditures	$28.1	$65.2	$93.3
Higher Education Expenditures	$25.7	$59.5	$85.2
Total State Operating Expenditures	**$111.2**	**$257.8**	**$369.0**
Non-Education Capital Expenditures	$12.4	$28.8	$41.2
Public Education Capital Expenditures	$0.2	$0.3	$0.5
Higher Education Capital Expenditures	$1.3	$3.2	$4.5
Total State Capital Expenditures	**$13.9**	**$32.3**	**$46.2**
Net State Revenue	**$176.6**	**$169.2**	**$345.8**

Source: Kem C. Gardner Policy Institute fiscal model

Table 2.4: Life Sciences Industry Local Fiscal Impacts in Utah, 2022
(Millions of Dollars)

Impact	Direct	Indirect & Induced	Total
Property Tax Revenues	$120.6	$211.9	$332.5
Local Sales Tax Revenues	$56.3	$88.1	$144.4
Total Local Revenues	**$176.8**	**$300.1**	**$476.9**
Local Expenditures (public ed & non-ed)	$84.5	$196.0	$280.5
Total Local Operating & Capital Expenditures	**$84.5**	**$196.0**	**$280.5**
Net Local Revenue	**$92.3**	**$104.0**	**$196.3**

Source: Kem C. Gardner Policy Institute fiscal model

Section 3. Workforce and Growth Trends by State

Utah's life sciences and health care innovation (life sciences) industry generated economic growth between 2012 and 2022. Compared with other industries and states, Utah's life sciences job growth was strong. In terms of workforce specialization, companies in the industry provided a large share of Utah's employee workforce relative to other states with significant life sciences industries.

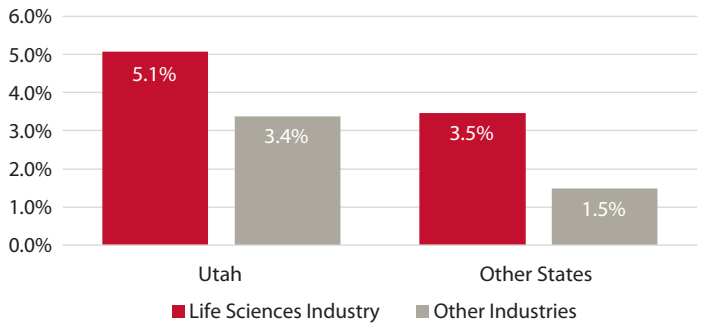
This section utilizes data based on an updated life sciences industry definition for Utah and other states. In 2022, the life sciences share of Utah's employee workforce was 2.1% under the legacy definition and 2.7% under the updated definition (see Section 5 under Defining the Industry). From 2012 to 2022, average annual job growth in Utah's life sciences industry was 4.4% under the legacy definition and 5.1% under the updated definition. For both definitions, Utah had the third highest 10-year growth rate among the 20 states with the most life sciences employment in 2022.

Utah's Growing Life Sciences Industry

On average from 2012 to 2022, the number of employee jobs in the life sciences industry increased by 5.1% per year in Utah versus 3.5% in other states (see Figure 3.1). Nationwide, life sciences companies added jobs more quickly than companies in other industries. Utah's growth advantage in life sciences was 1.7 percentage points versus other industries in the state (3.4% annual growth) and 1.6 percentage points versus other states' life sciences industries (3.5% annual growth).

Growth in Utah's life sciences industry regularly exceeds that of other industries in the state. From 2012 to 2022, life sciences employee job growth rates fluctuated between -0.6% and 7.2% per year (see Figure 3.2). Meanwhile, Utah companies in all other industries experienced job growth ranging from -1.3% to 5.8%. The rate for other industries fell below that of the life sciences industry every year except in 2015 and 2022.

Figure 3.1: Industry Job Growth, 2012–2022
(Compound Annual Growth Rate for Employment)



Note: Averages include all employees (no self-employed workers) based on an industry definition that aligns with historical data availability across states. Results for other states include 49 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. For data and definition details, see Table 5.3 in Section 5 under Workforce and Growth Trends by State.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

State Comparisons

In recent years, the life sciences industry has grown more quickly in Utah than in most other states. In eight of 10 years from 2012 to 2022, Utah's employee job growth exceeded the average for all other states (see Figure 3.3).

Among the 20 states with the largest life sciences industries by 2022 employment, Utah ranked third for its average annual job growth of 5.1% from 2012 to 2022, when other states' growth rates ranged from 1.3% to 5.6% (see Figure 3.4 and Table 3.1). In 2022, these 20 states provided 84.1% of U.S. life sciences employment, while the remaining 15.9% of jobs were in the 30 remaining states, territories, and the District of Columbia.

Job growth is supported by strong investment in life sciences companies. Utah has a high rate of venture capital investment for a state of its size. From 2018 to 2021, Utah ranked eighth at $678 per capita, higher than the nationwide average of about $600 per capita.[16]

Workforce Specialization in Life Sciences

Utah's workforce specializes heavily in life sciences. In 2022, life sciences companies provided 2.7% of Utah's employee jobs, well above the 1.5% average in all other states (see Figure 3.5). From 2013 to 2016, as its life sciences share rose from 2.4% to 2.5%, Utah ranked third for workforce specialization in life sciences among the 20 largest states by 2022 life sciences employment. Utah's share continued to increase from 2017 to 2021, the state ranking second each year and reaching 2.9% in 2021, before settling to 2.7% in 2022. From 2013 to 2022, Utah's average life sciences employment share (2.6%) was double the national average (1.3%).

As of 2022, among the 20 largest states with life sciences employment, Utah's workforce had the third highest life sciences concentration after Massachusetts and New Jersey (see Figure 3.6). Utah's 2.7% life sciences share of employee jobs in the state exceeded the 20-state average of 1.6%.

Within the life sciences industry, as of 2021, Utah's workforce specialization was at least 20% above the national average for three of four segments: medical devices and diagnostics; research, testing, and medical laboratories; and therapeutics and pharmaceuticals.[17] In the fourth segment, biosciences-related distribution, Utah was above the national average by less than 20%.[18] Among 119 metropolitan statistical areas (MSAs) with more than 250,000 employee jobs in the private

Features of State Employment Data

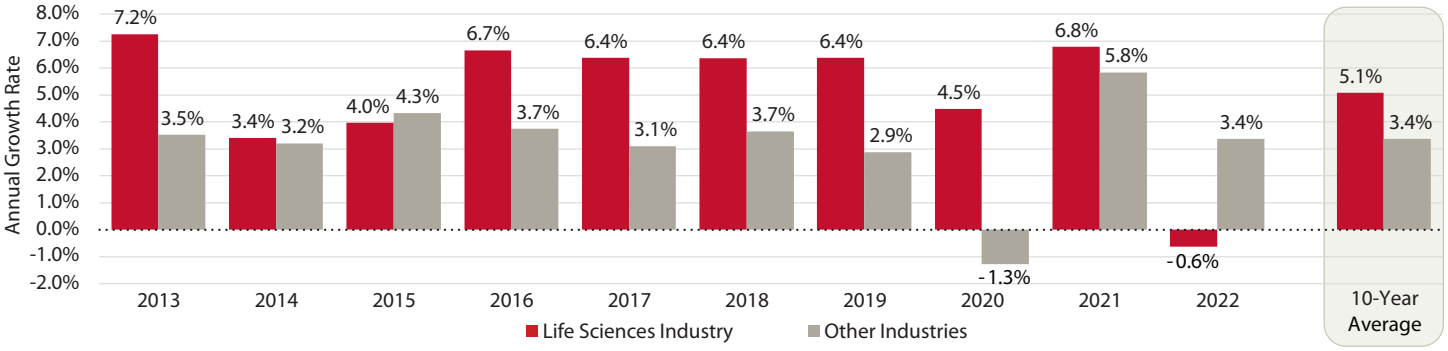
Life sciences industry employment data in Section 3 have features and limitations. The U.S. Bureau of Labor Statistics (BLS) compiles employer-reported job counts and shares annual totals for each state by detailed industry. State growth rates and rankings can change significantly from year to year. From 2013 to 2022 in the largest 20 states (by 2022 life sciences employment), 14 states had at least one year of negative industry job growth, 18 states had at least one year with growth at or above 6.0%, and 12 states met both criteria. Features and limitations of historical BLS employment data explain the noisy year-over data changes and can help readers interpret workforce and growth trends by state with caution and focus on longer-term growth trends.

- **Data Coverage:** Of 983 detailed industries in the 2022 North American Industry Classification System (NAICS), 17 belong in the life sciences industry definition for Section 3, which does not include companies handpicked from other NAICS industries. Also, the BLS data do not include self-employment.
- **Nondisclosure and Reclassification:** The BLS does not disclose state-level job counts for detailed industries with fewer than three companies or with a company that has 80% or more of total employment. Additionally, companies can switch NAICS industries at any point based on changes in their primary product or service.

  For example, Cytiva, a Utah life sciences company with 500 to 999 in-state jobs switched classification from a detailed industry where employment was disclosed in 2021 to one where employment was not disclosed in 2022. Even though Cytiva's old and new industries were both among the 17 life sciences NAICS industries, their 500–999 jobs are not counted in Utah's 2022 employment for comparison with other states. If Cytiva's employment were added to Utah's 2022 life sciences employment — with no adjustments for other companies, states, or years for consistency — Utah's life sciences job growth from 2021 to 2022 would be between 0.7% and 2.0%. In Sections 1 and 2, Cytiva is fully represented in employment and other Utah results for 2022.
- **Growth Rate Patterns:** Since an annual job growth rate is the percentage change in employment since the previous year, a large life sciences job growth rate may imply high industry employment during the current year and/or low industry employment during the previous year. This cumulative dynamic arose during the COVID-19 pandemic. States returning to trend after early declines in life sciences employment were poised for large annual growth rates. Meanwhile, states like Utah with very strong life sciences job growth in 2020 and 2021 relative to other states and industries were in a challenging position to retain previous employment gains and add yet more jobs in 2022 without a rebound effect.

For consistency in historical and cross-state comparisons based on BLS data, the Gardner Institute did not selectively revise Utah's employment growth in Section 3. Company-level data are not available for similar exploration and modifications for other states and years. Reclassifications can happen in any given state and year, offset in BLS data by companies starting or expanding operations in a state, as well as companies with industry reclassifications that add to life sciences industry employment.[15]

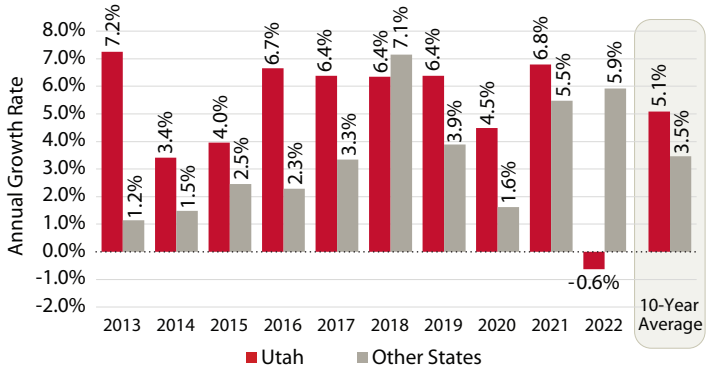
Figure 3.2: Utah Job Growth in Life Sciences and Other Industries, 2013–2022
(Annual Percent Change in Employment)



Note: Single-year growth rates are calculated as percentage changes since the previous year; 10-year averages are compound annual growth rates since 2012. The life sciences industry provided 23,327 jobs in 2012 and 38,283 jobs in 2022, while other industries provided 982,951 jobs in 2012 and 1,368,930 jobs in 2022. Results include all employees (no self-employed workers) based on an industry definition that aligns with historical data availability across states. For data and definition details, see Table 5.3 in Section 5 under Workforce Growth Trends by State.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Figure 3.3: Life Sciences Job Growth, Utah and Other States, 2013–2022

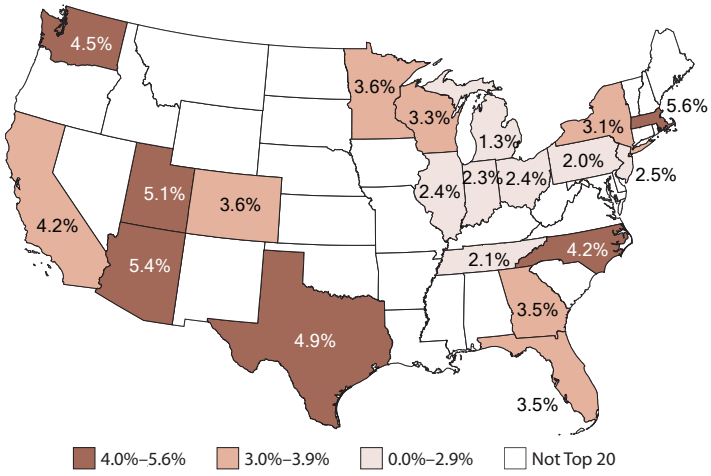
(Annual Percent Change in Employment)



Note: Single-year growth rates are calculated as percentage changes since the previous year; 10-year averages are compound annual growth rates since 2012. The life sciences industry in Utah provided 23,327 jobs in 2012 and 38,283 jobs in 2022, while in other states, the industry provided 1,316,933 jobs in 2012 and 1,850,485 jobs in 2022. Results include employees (no self-employed workers) at life sciences companies under an industry definition that aligns with historical data availability across states. Growth rates for other states include 49 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. For data and definition details, see Table 5.3 in Section 5 under Workforce Growth Trends by State.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Figure 3.4: Life Sciences Job Growth by State, 2012 to 2022

(10-Year Average Annual Percent Change in Employment for 20 States with the Highest Life Sciences Employment in 2022)



Note: Growth rates represent employees (no self-employed workers) at life sciences companies in 17 NAICS industries (see Table 5.3 in Section 5 under Workforce Growth Trends by State.) NAICS is the North American Industry Classification System.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Table 3.1: Life Sciences Job Growth by State, 2012–2022

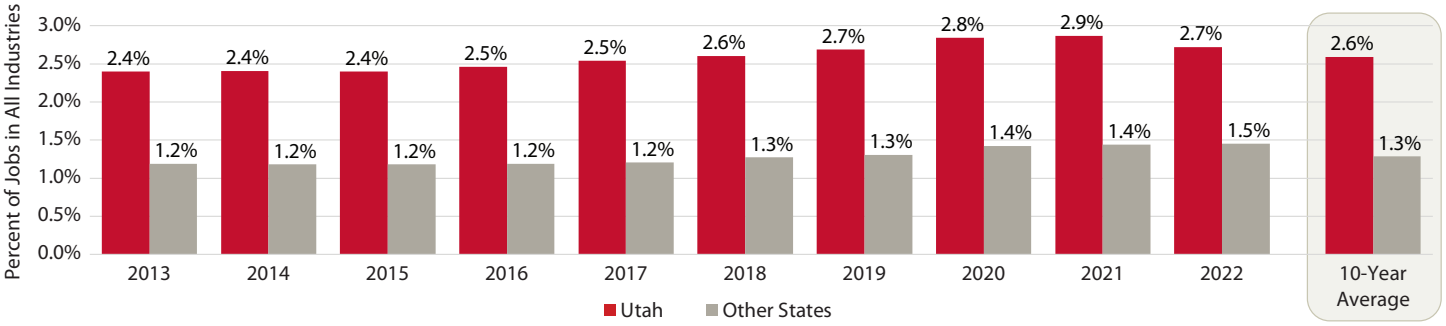
(Annual Percent Change in Employment for States with the 20 Largest Life Sciences Industries by Employment)

State	Annual Growth Rate (Since Previous Year)										10-Year Average Growth (2012 to 2022)		Industry Size by Employment (2022)
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Rate	Rank	Rank
Massachusetts	7.2%	3.4%	4.0%	6.7%	6.4%	6.4%	6.4%	4.5%	6.8%	9.4%	5.6%	1	2
Arizona	1.5%	4.0%	4.2%	5.6%	2.2%	9.3%	7.6%	4.4%	8.6%	8.6%	5.4%	2	15
Utah	1.2%	0.2%	6.3%	2.4%	11.2%	11.0%	5.1%	5.0%	4.0%	-0.6%	5.1%	3	14
Texas	0.9%	1.6%	5.3%	3.5%	4.8%	11.3%	6.0%	3.4%	5.9%	7.1%	4.9%	4	3
Washington	-2.0%	-4.0%	7.7%	6.7%	18.0%	5.4%	2.7%	2.5%	4.2%	5.4%	4.5%	5	16
North Carolina	1.6%	3.2%	2.3%	4.9%	6.9%	4.7%	4.5%	1.3%	6.6%	7.0%	4.2%	6	8
California	7.3%	1.6%	2.0%	-0.1%	2.7%	8.8%	3.1%	3.4%	6.9%	6.4%	4.2%	7	1
Minnesota	-0.4%	3.0%	2.9%	2.9%	6.6%	8.3%	2.6%	2.4%	4.3%	3.8%	3.6%	8	11
Colorado	3.4%	0.9%	2.5%	2.2%	2.2%	6.2%	5.9%	4.0%	3.8%	5.0%	3.6%	9	18
Georgia	-4.1%	1.3%	-1.0%	4.5%	34.3%	-12.4%	3.8%	3.9%	5.8%	7.3%	3.5%	10	19
Florida	2.5%	3.3%	3.3%	0.8%	0.9%	8.4%	2.3%	1.8%	5.7%	6.5%	3.5%	11	4
Wisconsin	0.7%	2.1%	5.6%	6.5%	3.4%	4.8%	3.1%	-2.8%	5.2%	11.1%	3.3%	12	20
New York	0.8%	0.7%	1.4%	1.2%	4.0%	11.4%	3.1%	-1.9%	5.3%	5.6%	3.1%	13	5
New Jersey	3.7%	1.6%	3.5%	1.2%	0.6%	7.0%	-1.2%	1.8%	3.4%	4.4%	2.5%	14	6
Illinois	1.7%	2.3%	2.5%	0.8%	-4.2%	7.4%	4.0%	-0.4%	7.1%	2.7%	2.4%	15	9
Ohio	1.8%	-6.0%	3.1%	-3.5%	-0.6%	19.3%	2.8%	1.1%	3.0%	4.6%	2.4%	16	12
Indiana	2.7%	-0.6%	0.6%	2.1%	1.5%	1.5%	5.1%	-0.8%	5.4%	5.9%	2.3%	17	10
Tennessee	-2.3%	-0.7%	1.1%	3.9%	3.5%	5.5%	4.4%	0.2%	0.9%	6.1%	2.1%	18	17
Pennsylvania	-0.7%	-1.3%	-2.1%	7.6%	0.8%	6.0%	1.7%	0.1%	3.7%	3.6%	2.0%	19	7
Michigan	2.0%	3.0%	-1.0%	-0.4%	-6.6%	3.6%	1.5%	-0.6%	6.0%	6.0%	1.3%	20	13
20 States	**1.6%**	**1.5%**	**2.6%**	**2.9%**	**3.9%**	**6.9%**	**3.9%**	**1.5%**	**5.6%**	**5.9%**	**3.6%**	**NA**	**NA**
U.S.	**1.3%**	**1.5%**	**2.5%**	**2.4%**	**3.4%**	**7.1%**	**3.9%**	**1.7%**	**5.5%**	**5.8%**	**3.5%**	**NA**	**NA**

Note: Ten-year averages are compound annual growth rates. Industry size rankings and top 20 selection are based on 2022 employment in the life sciences industry. Growth rates represent employees (no self-employed workers) at life sciences companies. U.S. row includes all states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. See Table 5.3 in Section 5 under Workforce Growth Trends by State, for more details about the data and industry definition for this section.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Figure 3.5: Life Sciences Share of Workforce, 2013–2022

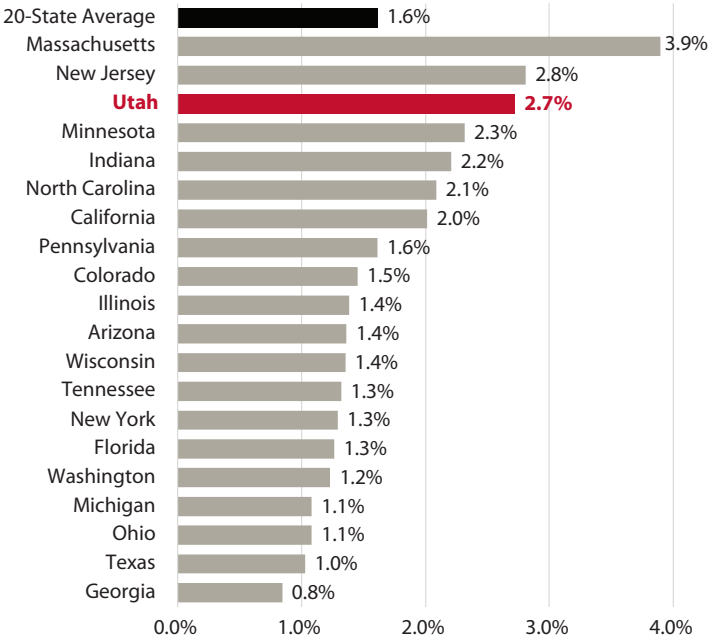
(Life Sciences Companies' Share of Total Employment)



Note: The life sciences industry in Utah provided 25,018 jobs in 2013 and 38,283 jobs in 2022, while in all other states, the industry provided 1,332,083 jobs in 2013 and 1,850,485 jobs in 2022. Results include employees (no self-employed workers) at life sciences companies under an industry definition that aligns with historical data availability across states. Shares for other states include 49 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. For data and definition details, see Table 5.3 in Section 5 under Workforce Growth Trends by State.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Figure 3.6: Life Sciences Share of Workforce in Leading States, 2022

(Life Sciences Companies' Share of Total Employment; Top 20 States by Employment)



Note: The national average was 1.5% for all states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. Workforce shares reflect a life sciences industry definition that aligns with historical data availability across states. Employment shares represent employees (no self-employed workers) at life sciences companies. For data and definition details, see Table 5.3 in Section 5 under Workforce Growth Trends by State.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

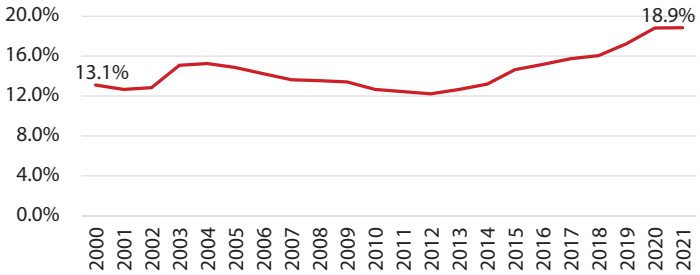
sector, the concentration of life sciences employment in the Salt Lake City MSA was the second-highest in medical devices and diagnostics, and seventh-highest in research, testing, and medical laboratories.[19] Among 136 MSAs with 75,000 to 250,000 employee jobs in the private sector, the Ogden-Clearfield MSA was fifth in medical devices and diagnostics specialization, the Ogden-Clearfield and Provo-Orem MSAs were eighth and ninth in therapeutics and pharmaceuticals specialization, and the Provo-Orem MSA was second in biosciences-related distribution specialization.[20] Among 190 MSAs with fewer than 75,000 employee jobs in the private sector, the Logan MSA in Utah and Idaho was seventh in medical devices and diagnostics, and eighth in research, testing, and medical laboratories.[21]

Section 4. Life Sciences in Higher Education

Through teaching and research, colleges and universities in Utah support advances in life sciences and health care innovation. Increasing numbers of students earn degrees in fields essential for the success of life sciences companies. Meanwhile, research universities generate innovation and commercialization opportunities in life sciences, in part through federal funding.

Figure 4.2: STEM Share of Higher Education Degrees Awarded, 2000–2021

(STEM Percentage of Total USHE Degree Completions)



Note: Completions are for associate, bachelor's, and graduate degrees in science, technology, engineering, and mathematics (STEM) fields at colleges and universities in the Utah System of Higher Education (USHE). Academic years end on June 30 of the year indicated. Percentage labels are for 2000 and 2021. See Table 4.2 for annual STEM shares of degree completions by institution.

Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System

Student Learning

At Utah's colleges and universities, students find and create opportunities that prepare them for varied roles at life sciences companies. Many individuals in life sciences careers benefit from academic programs in science, technology, engineering, or mathematics (STEM).[22] From 2000 to 2021, based on counts by academic year ending on June 30, students at Utah's public colleges and universities earned a total of 89,040 STEM degrees (see Figure 4.1).[23] Of these, 60.6% were bachelor's degrees, 22.8% were graduate degrees, and 16.6% were associate degrees. Annual degree completions rose from 2,371 STEM degrees in 2000 to 7,562 in 2021, an average increase of 5.7% per year. Growth rates exceeded 10% in 2002, 2003, 2015, 2019, 2020, and 2021.

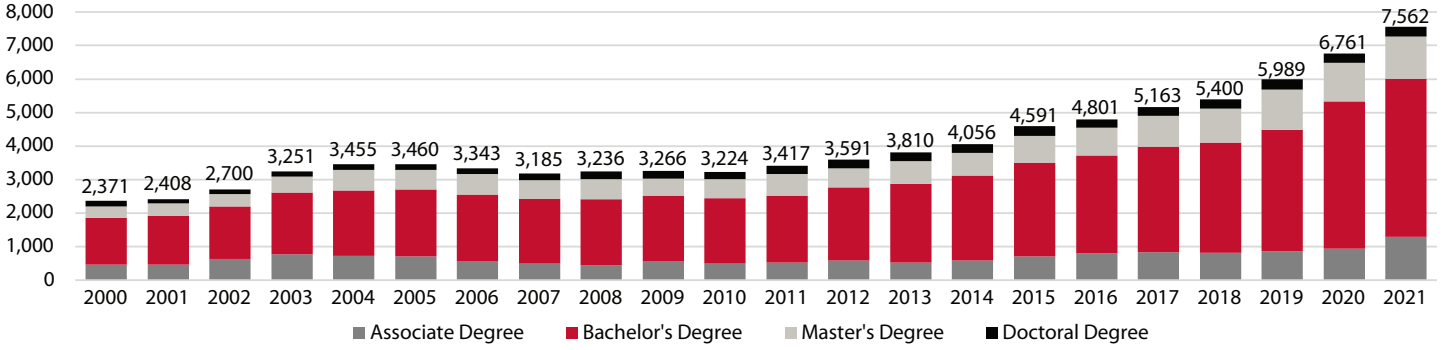
At Utah's institutions of higher learning, STEM programs have also grown in terms of their share of graduates. In 2000, 13.1% of degree completions in the Utah System of Higher Education (USHE) were in STEM programs (see Figure 4.2). This share jumped to 15.3% in 2004 before declining gradually for eight years. Since 2012, the STEM share of USHE degrees has consistently risen, again surpassing 15% and reaching a high of 18.9% in 2021.

From 2000 to 2021, STEM shares of degree completions at USHE institutions increased the most at the University of Utah (by 22.6 percentage points) and Utah Valley University (by 8.6 percentage points) (see Table 4.2).[24] At Salt Lake Community College, Snow College, Utah State University, and Weber State University, STEM shares rose by less than the USHE average of 5.8 percentage points. At Utah Tech University and Southern Utah University, STEM shares declined over the 21-year period but increased significantly since 2001 at Southern Utah University and 2006 at Utah Tech University. More recently, ten-year trends in STEM shares were positive at all institutions, with changes from 2011 to 2021 ranging from 2.8 to 19.8 percentage points.

In 2021, three universities — the University of Utah, Utah State University, and Utah Valley University — awarded a combined 5,944 STEM degrees. This accounted for 78.6% of the 2021 STEM total of 7,562 degrees from Utah's eight public colleges and universities (see Figure 4.3). The University of Utah awarded the highest number of associate, bachelor's, and graduate degrees in STEM, followed by Utah State University and Utah Valley University.

Figure 4.1: Higher Education STEM Degrees in Utah by Award Level, 2000–2021

(Number of Degree Completions at USHE Institutions)



Note: Completion counts are for degrees in science, technology, engineering, and mathematics (STEM) fields at colleges and universities in the Utah System of Higher Education (USHE). Academic years end on June 30 of the year indicated.

Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System

Table 4.1: STEM Degrees Awarded by USHE Institution, 2000–2021

(Number of Degree Completions)

Year	Salt Lake Community College	Snow College	Southern Utah University	University of Utah	Utah State University	Utah Tech University	Utah Valley University	Weber State University	Total
2000	128	76	112	788	751	129	81	306	**2,371**
2001	142	65	82	736	804	137	96	346	**2,408**
2002	201	80	124	823	748	161	212	351	**2,700**
2003	241	76	110	983	916	180	293	452	**3,251**
2004	237	81	110	1,095	923	133	353	523	**3,455**
2005	243	77	122	1,173	921	132	344	448	**3,460**
2006	256	64	129	1,182	968	35	303	406	**3,343**
2007	223	53	131	1,190	827	30	288	443	**3,185**
2008	216	52	108	1,300	843	36	257	424	**3,236**
2009	282	49	145	1,291	734	45	325	395	**3,266**
2010	240	55	112	1,263	785	53	284	432	**3,224**
2011	234	48	122	1,320	868	48	380	397	**3,417**
2012	252	59	130	1,425	854	57	384	430	**3,591**
2013	260	43	160	1,532	864	54	432	465	**3,810**
2014	311	42	147	1,678	939	65	473	401	**4,056**
2015	321	81	160	1,885	966	88	507	583	**4,591**
2016	355	69	149	1,934	1,057	62	589	586	**4,801**
2017	326	67	184	2,106	1,111	103	633	633	**5,163**
2018	300	42	150	2,268	1,203	95	701	641	**5,400**
2019	312	45	182	2,564	1,247	115	765	759	**5,989**
2020	327	81	238	3,037	1,340	127	878	733	**6,761**
2021	331	118	269	3,263	1,450	128	1,231	772	**7,562**

Note: Completion counts are for associate, bachelor's, and graduate degrees in science, technology, engineering, and mathematics (STEM) fields at colleges and universities in the Utah System of Higher Education (USHE). Academic years end on June 30 of the year indicated.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System

Table 4.2: STEM Share of Degrees Awarded by USHE Institutions, 2000–2021

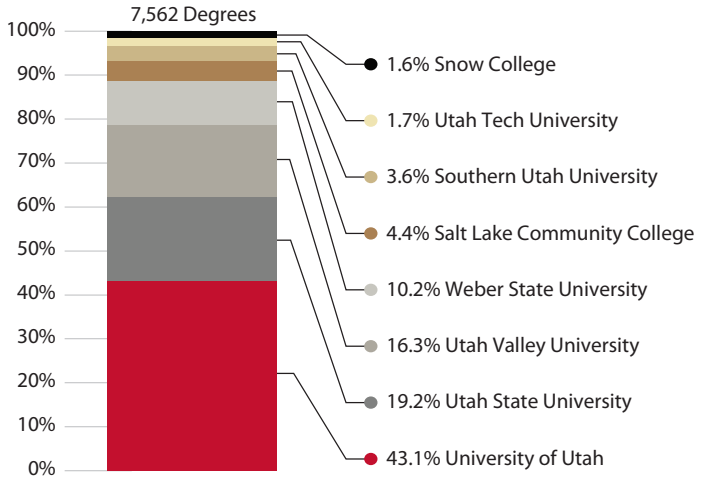
(STEM Percentage of Total Degree Completions at the College or University)

Year	Salt Lake Community College	Snow College	Southern Utah University	University of Utah	Utah State University	Utah Tech University	Utah Valley University	Weber State University	Total
2000	6.5%	10.3%	10.8%	15.7%	21.4%	17.6%	3.9%	10.2%	**13.1%**
2001	6.3%	9.3%	7.3%	15.4%	21.7%	18.9%	4.0%	10.4%	**12.7%**
2002	7.9%	10.5%	11.3%	14.0%	20.1%	19.2%	7.5%	10.5%	**12.9%**
2003	9.8%	10.5%	9.9%	16.1%	25.5%	19.8%	9.0%	13.3%	**15.1%**
2004	9.2%	11.1%	10.2%	15.9%	26.2%	14.6%	10.9%	14.1%	**15.3%**
2005	8.7%	11.3%	11.0%	16.8%	24.9%	14.0%	10.5%	11.9%	**14.9%**
2006	9.0%	8.4%	10.6%	17.1%	23.1%	3.8%	9.7%	11.6%	**14.3%**
2007	8.3%	7.8%	10.4%	17.3%	21.8%	3.0%	8.8%	11.8%	**13.7%**
2008	7.4%	8.4%	8.0%	18.2%	21.2%	4.0%	7.9%	11.3%	**13.5%**
2009	9.4%	8.3%	9.4%	18.1%	19.5%	4.5%	9.5%	10.1%	**13.4%**
2010	7.1%	8.4%	7.0%	18.5%	19.8%	4.4%	7.7%	10.6%	**12.7%**
2011	6.9%	6.4%	6.9%	18.4%	18.4%	3.3%	9.3%	9.7%	**12.4%**
2012	7.1%	7.3%	8.2%	19.1%	15.7%	3.5%	8.6%	9.7%	**12.2%**
2013	7.5%	5.9%	9.3%	19.7%	16.0%	3.3%	9.4%	10.0%	**12.7%**
2014	8.2%	6.0%	9.2%	22.0%	16.8%	3.9%	9.2%	8.7%	**13.2%**
2015	9.5%	10.0%	8.9%	23.7%	16.6%	5.4%	10.2%	11.7%	**14.6%**
2016	9.6%	7.8%	8.5%	24.8%	17.6%	3.8%	11.9%	11.8%	**15.2%**
2017	8.7%	7.1%	8.7%	25.9%	17.8%	6.3%	13.1%	12.5%	**15.8%**
2018	9.2%	4.5%	6.7%	27.7%	18.8%	5.8%	12.2%	12.2%	**16.1%**
2019	9.7%	4.4%	7.2%	31.0%	18.9%	6.7%	12.9%	13.9%	**17.2%**
2020	9.6%	7.8%	8.9%	35.8%	20.4%	6.9%	13.8%	13.1%	**18.8%**
2021	9.6%	11.3%	10.1%	38.2%	21.9%	6.8%	12.5%	12.7%	**18.9%**

Note: Completion counts are for associate, bachelor's, and graduate degrees in science, technology, engineering, and mathematics (STEM) fields at colleges and universities in the Utah System of Higher Education (USHE). Academic years end on June 30 of the year indicated.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System

Figure 4.3: Higher Education STEM Degrees Awarded by College and University, 2021

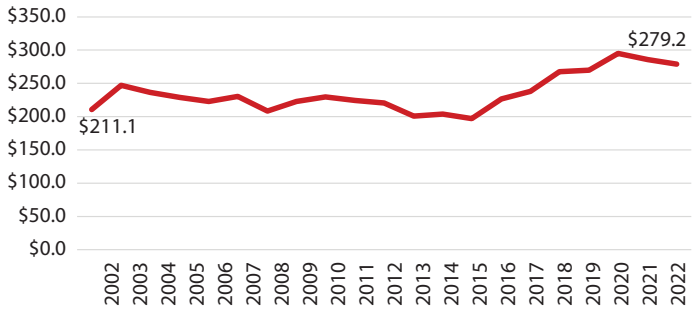
(Institution Share of USHE STEM Degree Completions)



Note: Completions are for associate, bachelor's, and graduate degrees in science, technology, engineering, and mathematics (STEM) fields at colleges and universities in the Utah System of Higher Education (USHE). This data for the 2021 academic year covers from July 1, 2020 to June 30, 2021. See Table 4.1 for annual STEM degree completion totals by institution since 2000.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System

Figure 4.4: Utah Awards from the National Institutes of Health, FY 2002–2022

(Funding in Millions of 2022 Dollars)



FY = Federal fiscal years ending September 30 of the year indicated
Note: Funding types were grants, contracts, and direct payments. Labels are for the first and last year. Amounts are adjusted for inflation by the Bureau of Labor Statistics U.S. Consumer Price Index (CPI) from their fiscal year CPI to the 2022 calendar year CPI.
Source: U.S. Department of Health and Human Services, National Institutes of Health, Research Portfolio Online Reporting Tools (RePORT)

Research Funding

Academic research is essential for the success of many life sciences companies. Life sciences research at Utah's public and private higher education institutions attracts out-of-state funding, such as federal grants, to the state. The faculty, staff, and students at Utah colleges and universities apply research in ways that improve health care and develop medical technologies for commercialization.

The National Institutes of Health (NIH) funds medical research and is the primary source of funding for academic life sciences research in Utah. From federal fiscal year (FY) 2012 to 2022, NIH funding grew by an average of 2.4% per year, adjusted for inflation (see Figure 4.4). The largest increases happened from FY 2015 to FY 2020 following years without sustained real growth. In FY 2022, Utah-based organizations received $279.2 million in awards from NIH, consisting of grants (92.0%), research and development contracts (6.5%), and direct payments (1.5%).[25]

A significant portion of NIH awards fund life sciences research. NIH priorities include basic and clinical research to help understand, treat, and prevent a variety of health concerns. Nine of the 27 NIH institutes and centers awarded more than $50 million each in Utah funding from FY 2018 to FY 2022. Ordered from most funding to least, the nine institutes address general medical sciences; heart, lung, and blood diseases; cancer; allergy and infectious diseases; neurological disorders and stroke; child health and human development; drug abuse; diabetes and digestive and kidney diseases; and eye diseases and visual disorders. These institutes provided 72.2% of all NIH funding to Utah during the five years.[26]

From FY 2018 to FY 2022, the average annual NIH funding in Utah, adjusted for inflation, was $279.5 million. The University of Utah received most of this funding (87.6%), followed by Utah State University (3.4%), Brigham Young University (2.1%), Utah Valley University (0.1%), and Weber State University (0.04%) (see Figure 4.5 and Table 4.3). The NIH awarded the remaining 6.8% of its Utah funding outside of higher education, primarily to life sciences companies.

Institutions of higher learning received the vast majority ($1,302.6 million) of NIH funding in Utah from FY 2018 to FY 2022. The remaining $95.0 million in grants, contracts, and direct payments went to 51 companies and nonprofits. The median award amount outside of academia was $769,600, with awards ranging from $19,500 to $10.0 million. Among the recipients of NIH funding, 21 life sciences companies and two health care providers each received over $1 million. Life sciences industry recipients included therapeutic and pharmaceutical companies; research, testing, and medical laboratories; and medical device companies.

University Innovation and Commercialization

Research at Utah's institutions of higher learning supports innovation and commercialization in the life sciences. Particularly at leading research universities, faculty, staff, and students invent, patent, and disseminate new technologies related to health care.

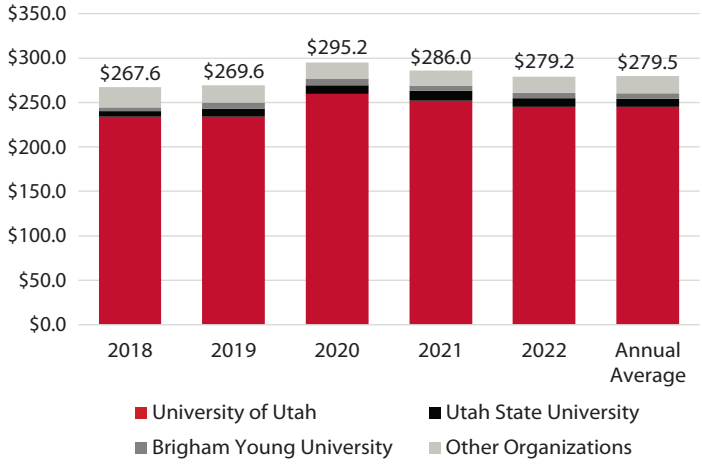
This section documents life sciences innovation at the University of Utah and Utah State University.[27] Of Utah's public and private institutions of higher learning, these two universities have received the most federal funding for life sciences research from the National Institutes of Health (see Figure 4.5 and Table 4.3). They are also the only universities in Utah that the American Council on Education has designated "R1" for their "very high levels of research activity" in terms of research and development expenditures, doctoral degree awards, and research staffing levels.[28]

Table 4.3: Utah Awards from the National Institutes of Health by Recipient, FY 2018–2022
(Funding in Millions of 2022 Dollars)

Recipient	2018	2019	2020	2021	2022	Annual Average	Total	Share
University of Utah	$233.8	$233.8	$259.7	$252.1	$245.1	$244.9	$1,224.5	87.6%
Utah State University	$6.6	$9.3	$9.9	$11.1	$10.1	$9.4	$47.0	3.4%
Brigham Young University	$4.2	$7.0	$7.5	$5.4	$5.9	$6.0	$30.0	2.1%
Utah Valley University	$0.0	$0.4	$0.0	$0.0	$0.4	$0.2	$0.8	0.1%
Weber State University	$0.3	$0.0	$0.0	$0.0	$0.0	$0.1	$0.3	0.0%
Other Organizations	$22.6	$19.1	$18.1	$17.4	$17.8	$19.0	$95.0	6.8%
Total	**$267.6**	**$269.6**	**$295.2**	**$286.0**	**$279.2**	**$279.5**	**$1,397.6**	**100.0%**

FY = Federal fiscal years ending September 30 of the year indicated
Note: Over the five years, NIH awards included grants (93.3% of all funding), contracts (6.0%), and direct payments (0.7%). Other recipients include 48 companies, primarily life sciences, two health care providers, and a nonprofit foundation. Amounts are adjusted for inflation by the Bureau of Labor Statistics U.S. Consumer Price Index (CPI) from their fiscal year CPI to the 2022 calendar year CPI.
Source: U.S. Department of Health and Human Services, National Institutes of Health, Research Portfolio Online Reporting Tools (RePORT)

Figure 4.5: Utah Awards from the National Institutes of Health by Recipient, FY 2018–2022
(Funding in Millions of 2022 Dollars)



FY = Federal fiscal years ending September 30 of the year indicated
Note: Other recipients include 53 organizations, primarily life sciences companies but also Utah Valley University and Weber State University with a combined $1.8 million in average annual NIH funding. Funding types are grants (most common), contracts, and direct payments. Amounts are adjusted for inflation by the Bureau of Labor Statistics U.S. Consumer Price Index (CPI) from their fiscal year CPI to the 2022 calendar year CPI.
Source: U.S. Department of Health and Human Services, National Institutes of Health, Research Portfolio Online Reporting Tools (RePORT)

Recent measures of research activity show noteworthy productivity in life sciences programs at leading research universities in Utah. From 2018 to 2022, based on counts by academic year ending on June 30, the annual number of life sciences invention disclosures averaged 145.6 per year at the University of Utah and 6.6 at Utah State University (see Table 4.4).[29] Their five-year averages for life sciences patents issued (awarded by the U.S. Patent and Trademark Office) were 159.8 and 5.0 patents per year, respectively. Annual variation was significant for both measures of research activity.

Turning to commercialization, the total number of license agreements in life sciences over five years was 77 for the University of Utah and 19 for Utah State University. During this period, 34 life sciences startups came from the University of Utah and one life sciences startup came from Utah State University.

Definitions for University Research and Commercialization

- **Invention Disclosure** – Research universities in Utah have established processes for identifying new technologies from faculty and students that may have commercial and public value. Some researchers who disclose (document) an invention also apply for a patent, pursue a licensing agreement, and/or assist in forming a startup.
- **Licensing Agreement** – This is a contract between a university and a business for the application of university innovation. It typically stipulates payment for permission to use a specific technology.
- **Patent Issued** – Patent applications from university researchers in Utah are submitted to the United States Patent and Trademark Office, which may then grant the patent.
- **Startups** – In terms of higher education research commercialization, a startup refers to a new business or organization that formed to further develop and use a licensed technology from academic researchers.

Life sciences featured prominently among all new innovations tracked by technology transfer offices at the two universities. For example, from 2018 to 2022, life sciences technologies were the subject of 81.5% of all patents issued at the University of Utah and 60.2% of all of its license agreements (see Figure 4.6). During the same period at Utah State University, life sciences accounted for 36.8% of all patents issued and 11.0% of all license agreements. At both institutions, life sciences shares of all invention disclosures and startups were in between the institutions' shares for patents and licensing.

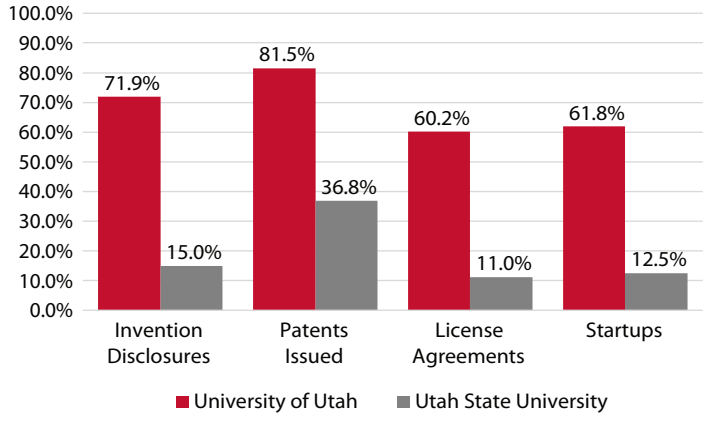
During the academic years 2018 through 2022, most new life sciences technologies from the University of Utah were

Table 4.4: Life Sciences Innovation at the University of Utah and Utah State University, 2018–2022
(Counts)

Measure	2018	2019	2020	2021	2022	Annual Average	5-YearTotal
University of Utah							
Invention Disclosures	99	159	128	182	160	145.6	728
Patents Issued	164	144	216	145	130	159.8	799
License Agreements	16	6	19	25	11	15.4	77
Startups	6	4	8	12	4	6.8	34
Utah State University							
Invention Disclosures	16	7	3	5	2	6.6	33
Patents Issued	12	3	3	4	3	5.0	25
License Agreements	4	3	9	3	0	3.8	19
Startups	1	0	0	0	0	0.2	1
Total							
Invention Disclosures	115	166	131	187	162	152.2	761
Patents Issued	176	147	219	149	133	164.8	824
License Agreements	20	9	28	28	11	19.2	96
Startups	7	4	8	12	4	7.0	35

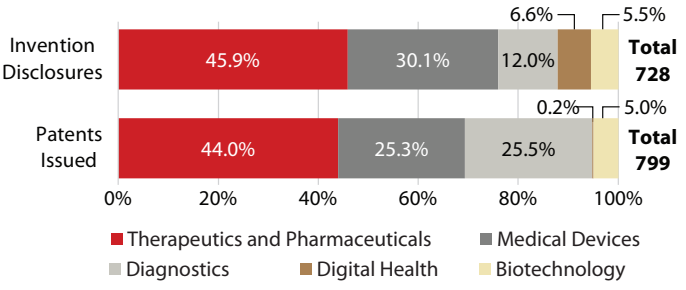
Note: Academic years end on June 30 of the year indicated.
Source: University of Utah, PIVOT Center, personal communication; Utah State University, Technology Transfer Services, personal communication

Figure 4.6: Life Sciences Shares for Innovation Measures at the University of Utah and Utah State University, 2018–2022
(Percentage of 5-Year Total Counts for All Fields)



Note: The five-year period is for academic years ending on June 30, 2022.
Source: University of Utah, PIVOT Center, personal communication; Utah State University, Technology Transfer Services, personal communication

Figure 4.7: Life Sciences Innovation Categories at the University of Utah, 2018–2022
(Share of 5-Year Total Counts)

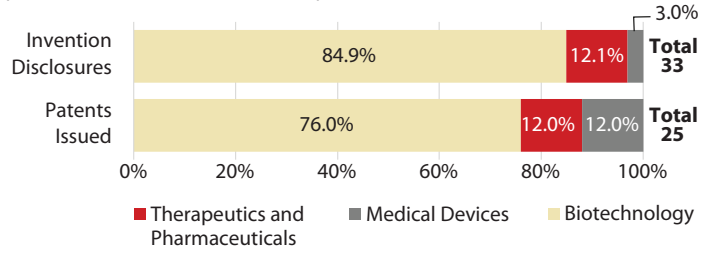


Note: The five-year period is for academic years ending on June 30, 2022.
Source: University of Utah, PIVOT Center, personal communication

in therapeutics and pharmaceuticals (45.9% of invention disclosures) or medical devices and diagnostics (30.1%) (see Figure 4.7). The remaining 24.0% of disclosures were in diagnostics, digital health, or biotechnology. In contrast, at Utah State University, the majority of life sciences invention disclosures were in biotechnology (84.9%) (see Figure 4.8). The remaining disclosures for new technologies were in therapeutics and pharmaceuticals (12.1%) or medical devices and diagnostics (3.0%).

Of the 25 patents awarded to Utah State University researchers in life sciences during these years, the biotechnology share of 76.0% was somewhat lower than the disclosure share. For both the medical devices and diagnostics segment and the therapeutics and pharmaceuticals segment, patents issued constituted 12.0% of the university's life sciences total.[30] Nationwide, for an overlapping period, calendar years 2018 to 2021, and including innovation outside of higher education, the leading categories for life sciences patent awards were medical and surgical devices (52.4%), pharmaceuticals (17.8%), and biochemistry (11.4%).[31]

Figure 4.8: Life Sciences Innovation Categories at Utah State University, 2018–2022
(Share of 5-Year Total Counts)



Note: The five-year period is for academic years ending on June 30, 2022.
Source: Utah State University, Technology Transfer Services, personal communication

Section 5: Research Methods

This section provides additional insight into how we conducted our analysis. We provide notes about developing the life sciences industry definition, creating estimates for self-employed workers, calculating workforce demographics for workers in the life sciences industry and STEM occupations, running our economic model, estimating tax revenues and government expenditures, comparing Utah's life sciences industry to other states, and analyzing life sciences student learning.

Defining the Industry

The Gardner Institute definition for Utah's life sciences industry includes every company in 17 industries (see Table 1.1 in Section 1) and 126 establishments of named (handpicked) companies in 41 other NAICS industries (see Table 5.1). The authors' review with BioUtah and BioHive for life sciences companies outside of the 17 primary industries centered on, but was not limited to, NAICS 541380 "Testing Laboratories and Services" and NAICS 541715 "Research and Development in the Physical Engineering, and Life Sciences (Except Nanotechnology and Biotechnology)," both of which have a concentration of life sciences companies. Sections 1 and 2 of the report utilize this definition.

Section 3 on workforce and growth trends by state adopts an updated life sciences definition for better alignment as the industry has evolved in Utah and other states. For their March 2023 research brief, the authors included 17 industries under the 2022 North American Industry Classification System (NAICS), up from 15 NAICS industries in previous Gardner Institute research.[32] For results comparable to other states, self-employed workers and handpicked companies are excluded from this section. The updated definition emerged from a national literature review with input and validation from BioUtah and BioHive leadership. The literature review included publications from 2019 to 2022 from the Economic Development Corporation of Utah, Biotechnology Innovation Organization, California Life Sciences Association, Indiana Business Research Center, Massachusetts Biotechnology Council, Ohio Life Sciences Foundation, and North Carolina Biotechnology Center.[33]

This report focuses on companies in the private sector and does not include public sector activity in the labor force or economic impact analysis. Public sector activity in life sciences includes the academic research described in Section 4 and government programs.

Table 5.1: Life Sciences Industry Definition – Handpicked Companies

Segment and Company	NAICS Code[1]	Establishments[2]
RESEARCH, TESTING, AND MEDICAL LABORATORIES		
Advanced Clinical	541715	1
Aliri Bioanalysis	541380	1
Alliance for Multispecialty Research	541715	1
ALS	541380	1
Alterra Medical	541611	1
American Biotech Labs	541380	1
American West Analytical Labs	541380	1
Analytical Resource Laboratories	541380	1
Ancestry.com[3]	541990	1
Battelle Memorial Institute	541715	3
Caisson Labs	541715	1
CCT Research[4]	541715	1
Celerion	541715	1
CenExel	541715	1
Chrysalis Clinical Research	541715	1
Clinical ink	541511	1
Clinical Reference Laboratory	513210	1
Contract Testing Laboratories of America	541380	1
CR Foundation	541715	1
Dixon Information	541380	1
DNB Engineering	541380	1
Dyad Labs	541380	1
EC Service	541715	1
FlintBio	424590	1
Fresenius	611430	1
Howard Hughes Medical Institute	541715	1
ICON[5]	541715	2
J Lewis Research	541715	5
Labcorp[6]	541380 541690 541715	4
LifeStance Health	621330	1
Mobile MBS	621512	1
Natera	541380	1
NutriBiome	541380	1
Precision Diagnostics	541380	1
Precision Testing Technologies	541380	1
Progenitor MDX	541380	1
Quest Diagnostics	621512	2
Rapid Genomics[7]	541380	1
Regeneron Pharmaceuticals	541990	1
Renalytix[8]	513210	1
Revance Therapeutics, Inc.	541380	1
Sarcos Technology and Robotics	541715	1

Segment and Company	NAICS Code[1]	Establishments[2]
Sema4 Genomics	541380	1
Smart Electric Power Association	541715	1
Sorenson Forensics	541380	1
Sotera Health	541380 541690 551114	3
Southwest Research Institute	541715	1
Syneos Health	541715	1
Thermo Fisher Scientific[9]	541715	1
US BioTek Laboratories	541380	1
Utah Kidney Research Institute	541715	1
Verily Life Sciences[10]	541715	1
Wasatch Labs	541380	1
Western Institute for Veterans Research	813211	1
Segment Total		**67**

MEDICAL DEVICES AND DIAGNOSTICS

AccuBreath	541715	1
ATL Technology	423690	1
BioFi	334412	1
Biomerics	326199	1
Birdie Resolution Pharmaceutical	813910	1
BraveHeart Wireless	513199	1
Carterra	334513	1
Espiritu Design	533110	1
Extreme Motus	441227	1
Fresenius	541613 561110 621492	4
Genestat Molecular Diagnostics	541613	1
INNERgy Development	541715	1
IONIQ Sciences	541715	1
JD Machine	332710	1
Leupold	333310	1
Microsurgical Innovations	541715	1
Myriad Genetics[11]	561499	1
Neonatal Rescue	523910	1
Nusano	541690	1
nView Medical	541990	1
Opticare Vision Services	333310	1
PhotoPharmics	541715	1
Ripple Neuro	541715	2
Robin Healthcare	561990	1
Sorenson BioScience	333511	1
Steribin	335139	1
TherapEase Innovations	449210	1
Thermo Fisher Scientific[9]	423740 541715	2
Zien Medical Technologies	541715	1
Zigg Design	332710	1
Segment Total		**35**

Segment and Company	NAICS Code[1]	Establishments[2]

BIOSCIENCES-RELATED DISTRIBUTION

1-800 Contacts	456130 493110	3
Biogen	541990	1
BioUtah	813910	1
Celgene[11]	425120	1
Fluidx Medical Technology	425120	1
Intrepid Biosciences	541612	1
Kyowa Hakko	425120	1
MiMedx Group	425120	1
Scientific Consumables and Instrumentation	423840	1
Syneos Health	425120	1
Thermo Fisher Scientific[9]	326111	1
Segment Total		**13**

THERAPEUTICS AND PHARMACEUTICALS

ACELYRIN	541715	1
Bastion Technologies	541715	1
GlycoMira Therapeutics	541715	1
Halia Therapeutics	541715	1
Ileo Science	325199	1
Intrinsic Medicine	541990	1
KalVista Pharmaceuticals	541715	1
Lipocine	541715	1
Navigen	541715	1
OmniLytics	541715	1
Tula Health	621399	1
Segment Total		**11**

Life Sciences Total (Handpicked)		**126**

Notes:

1. NAICS codes identify detailed industries from the 2022 North American Industry Classification System commonly used to categorize companies.
2. An establishment is a business location or unit. A company may have multiple Utah establishments in one or more NAICS industries. Counts do not include proprietorships with only self-employed workers or other companies without Utah employees.
3. The part of Ancestry.com primarily involved in DNA and lab testing is included.
4. CCT Research is a subsidiary of Avacare Clinical Research Network.
5. PRA Health Sciences is part of ICON.
6. Besides its four handpicked establishments that were formerly Covance, Labcorp has 23 Utah establishments included based on their NAICS industries (541714 and 621511).
7. Rapid Genomics is part of the LGC Group.
8. Several life sciences companies have a significant presence in a segment besides the one assigned for this study: Renalytix, Fluidx, and Tula Health in the "medical devices and diagnostics" segment and Nusano and Celgene in the "therapeutics and pharmaceuticals" segment. Segment assignments in the study are based primarily on NAICS industries. Also, Celgene is part of Bristol Myers Squibb.
9. Thermo Fisher Scientific includes Invitrogen and Pharmaceutical Product Development (PPD).
10. Verily Life Sciences is part of Alphabet Inc.
11. Besides its handpicked establishment for women's health, Myriad Genetics has two Utah establishments included based on their NAICS industry (541714).
12. As a trade association, BioUtah does not fit neatly in any segment. In 2022, BioHive was an entity in the BioUtah organization. In 2023, BioHive became a distinct nonprofit.

Source: Utah Department of Workforce Services, Quarterly Census of Employment and Wages, Firm Find and personal communication

Self-Employed Workers

The number of self-employed workers in Utah's life sciences industry is not available from the Utah Department of Workforce Services (DWS) because its data come from surveys answered only by companies with employees. The Bureau of Economic Analysis (BEA) includes self-employed workers, referred to as proprietors. BEA provides Utah proprietor employment for large industry groupings through 2021. DWS provides industry and company granularity for Utah in 2022 that matches our definition of the life sciences industry. For this reason, to estimate the number of proprietors, we multiplied DWS employment in each specific NAICS industry by the 2021 ratio of proprietors to total employment in the corresponding larger NAICS industry grouping from BEA.

To estimate proprietors' income, we determined average proprietors' income for corresponding BEA industry groupings in 2021. We multiplied our 2022 proprietor employment estimates by average proprietors' income in 2021, adjusted for inflation to 2022 dollars using the consumer price index for all urban consumers, not seasonally adjusted. This method understates proprietors' income by any 2022 earnings growth above inflation.

Workforce Demographic Analysis

Results in Figures 1.7 through 1.14 rely on a U.S. Census Bureau survey. Each year, approximately 1% of households in Utah and other states respond to American Community Survey (ACS) questions on individuals' employment status, occupation, industry, race, ethnicity, and sex. The University of Minnesota compiles and prepares ACS data in its Integrated Public Use Microdata Series (IPUMS).[34] Workforce demographics results in Section 1 are from five years of pooled data in pursuit of reliably large sample sizes for demographic groups in the life sciences industry and STEM occupations. In the five-year ACS IPUMS data release, 2017 to 2021, the Utah sample included 83,066 housing units. Point estimates shown in the eight charts benefit from person-level weights that make the ACS sample more representative of the general population. Confidence intervals around these point estimates are based on a corresponding series of 80 person-level "replicate" weight variables that carefully represent sampling error possibilities. The U.S. Census Bureau prepared both types of ACS weights.

Life Sciences Industry

Under the North American Industry Classification System (NAICS) an industry categorizes a company's primary product or service, its main line of business. The smallest demographic group in the workforce for the life sciences industry was American Indian or Alaska Native with 18 responses, and there were 20 responses from Native Hawaiian or Other Pacific Islander people and 22 responses from Black or African American people. All other groups had more than 50 responses from people working in a life sciences NAICS code. Confidence intervals in Figures 1.7 through 1.10 help readers assess inherent uncertainty in generalizing from high-quality sample data to the general population of working adults.

ACS IPUMS data include demographic data by industry at the four-digit NAICS code level. Results in this section include the nine four-digit NAICS codes listed in Table 5.2.[35] Responses from individuals working in each industry were weighted by 100% or less based on the share of employment within the four-digit NAICS code that is included in the life sciences definition. Weights to incorporate life sciences shares of aggregated NAICS industries were applied in the ACS dataset along with published person weights from the U.S. Census Bureau that make the ACS sample more representative of the general population.

Table 5.2: Life Sciences Share of Industry Employment in Utah, 2017–2021

	Share of Jobs in Four-Digit NAICS Industries[1]		All Six-Digit NAICS Codes Within Four-Digit ACS Industries by Life Sciences Definition Treatment	
Four-Digit ACS Industries[2]	Life Sciences	Not Life Sciences	Life Sciences	Not Life Sciences
3254	100.0%	0.0%	32541[1 to 4]	—
3345	32.5%	67.5%	33451[0, 6, & 7]	33451[1 to 5 & 9]
3391	91.0%	9.0%	33911[2 to 5]	339116
4234	41.6%	58.4%	4234[50 & 60]	4234[10 to 40 & 90]
621M	75.2%	24.8%	621511	621512 & 6219[10, 91, & 99]
424M	60.6%	39.4%	424210	4246[10 & 90]
5417	57.3%	42.7%	54171[3 to 4]	5417 [15 & 20]

Notes:

1. Percentages are based on five-year averages for total private employment by industry, without accounting for handpicked life sciences companies in other NAICS industries. NAICS codes are from the 2022 North American Industry Classification System commonly used to categorize companies.
2. The American Community Survey (ACS) uses aggregated industries, identified by four-digit codes in the hierarchical NAICS structure. Each industry with a four-digit code incorporates multiple six-digit NAICS industries. In ACS data, NAICS 621M combines NAICS 6215 and 6219, and NAICS 424M combines NAICS 4242 and 4246.

Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Current Employment Statistics by state and metro area

STEM Occupations

The Standard Occupation Classification (SOC) system categorizes a worker's role based on the nature of their work and skills, regardless of their employer's product, service, or industry. Examples of occupations comprising the science, technology, engineering, and mathematics (STEM) definition include 15-1131 computer programmers, 15-2021 mathematicians, and 17-2031 biomedical engineers. People in these occupations work in multiple industries. The smallest demographic group in the STEM workforce was Black or African American with 23 responses, and there were 24 responses from Native Hawaiian/Other Pacific Islander people and 25 responses from American Indian or Alaska Native people. All other groups had more than 50 responses from people in STEM occupations. Much larger sample sizes were available by sex in Utah and by race, ethnicity, and sex in the U.S. Confidence intervals in Figures 1.11 through 1.14 help readers assess inherent uncertainty in generalizing from high-quality sample data to the general population of working adults.

Specific occupations are categorized under the 2018 SOC system used by the U.S. Census Bureau and U.S. Bureau of Labor Statistics (BLS). A BLS STEM definition identifies 102 six-digit SOC codes for occupations in life and physical science, engineering, mathematics, and information technology.[36] Workforce demographics results in this document do not include the social science, architecture, or health care occupations found in the BLS STEM definition, since life sciences companies are less likely to employ people in those three fields. Most life sciences workers (85.0%) are not in STEM occupations, and even with this adjustment, more than 90% of STEM workers employed in Utah are outside of the life sciences industry. Much of STEM workers' knowledge and experience is transferrable across industries.

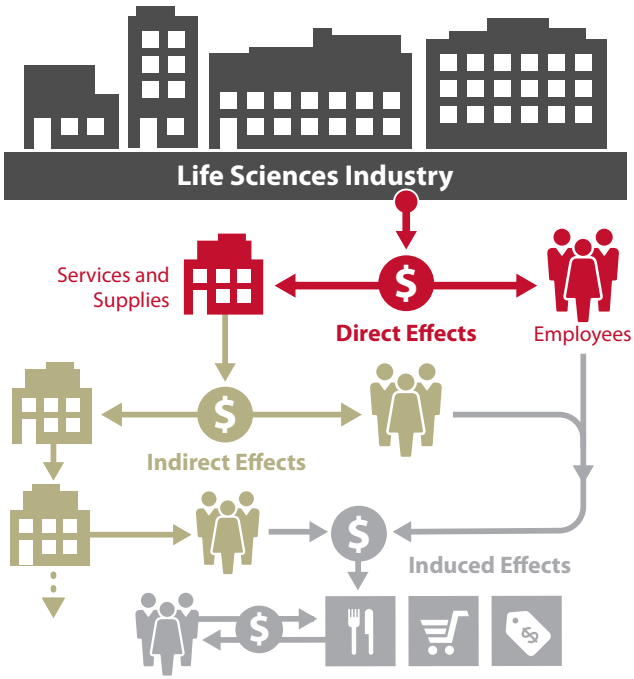
Economic and Fiscal Impacts

Economic impact is a concept that focuses on jobs and spending arising directly and indirectly from new money entering a state. Exports from a state are one way to attract outside dollars. For example, Utah life sciences companies sell drugs and medical devices to pharmacies and health care providers in other states and countries. The direct jobs and spending that produce goods and services sold out of state generate economic impacts. In studies such as this encompassing an entire industry, the direct, indirect, and induced economic activity that would be lost to a state in the absence of the industry can also be considered an economic impact. We refer to this as import substitution, with in-state production and consumption displacing imports to a state, whether from abroad or another state. Whereas the life sciences industry's out-of-state sales (exports) bring in additional resources to grow a state's economy, in-state sales prevent an outflow of resources to purchase from companies outside the state (import substitution).

The choice to count import substitution as an economic impact rests on the use of the counterfactual, "What would Utah's economy look like if it had no life sciences industry?" With this framing question, the criterion for determining what economic activity in an industry should be counted as an economic impact is whether economic activity would be lost if the industry were not present in the state. This criterion qualifies exports as economic impacts and prompts us to consider what Utah companies and individuals would buy from other states if Utah's life sciences industry were not supplying these goods and services. The life sciences industry's in-state sales keep dollars in Utah that otherwise would leave the state to pay for imports from other states and countries.[37] In this sense, all production by the life sciences industry is an economic impact, either through this "import substitution" logic or the previous "export" rationale.

The life sciences industry generates economic effects (contributions and impacts) through its spending on wages and purchases from Utah-based vendors (direct effects) and the rippling effect of this spending through the economy (indirect and induced effects). Life sciences companies' spending produces indirect effects when their local suppliers hire employees and make purchases from other local vendors. Finally, induced effects occur when the employees of life sciences companies and their suppliers spend their wages in the Utah Economy (see Figure 5.1).

Figure 5.1: Economic Flow of Direct, Indirect, and Induced Economic Impacts



Source: Kem C. Gardner Policy Institute

Direct estimates for life sciences industry sales, GDP, non-payroll spending, compensation, self-employment, and proprietors' income are based on these six measures' industry-specific relationships with employment or wages. Estimates for the first four items are from the REMI PI+ economic model described below, which incorporates national- and state-level data from the U.S. Bureau of Economic Analysis (BEA). Estimates for the last two items (self-employment jobs and proprietors' income) are based on 2021 industry averages directly from the BEA.

To estimate the indirect and induced effects resulting from direct economic activity in the life sciences industry, we customized an economic impact model for Utah. REMI PI+ version 3.0, developed by Regional Economic Models, Inc., is a dynamic, multi-regional simulation model that estimates economic, population, and labor market impacts of specific economic or policy changes. The model incorporates input-output relationships, general equilibrium effects, econometric relationships, and economic geography effects.

The 70-sector model generally aggregates to two-digit or three-digit NAICS sectors, rather than fully incorporating the six-digit and selected company specificity of our data from DWS. We adjusted for the difference in wages between the aggregated NAICS sectors in REMI and actual wages at companies in our life sciences definition to regain precision lost by the model's 70-sector limitation.

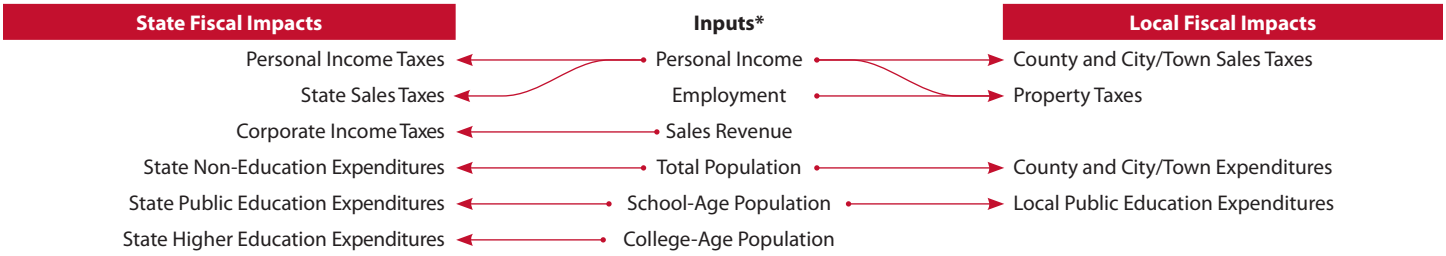
We used REMI to estimate the amount of Utah life sciences output sold in-state, out-of-state, and outside the country. REMI reports 2022 sales by location for large industries, based on data from the U.S. Bureau of Economic Analysis. The 17 NAICS industries that make up Utah's life sciences sector fall under six of REMI's large industries. For example, "pharmaceutical preparation manufacturing" falls under "chemical manufacturing." We assumed life sciences companies in Utah sold similar percentages of their 2022 output in-state, out-of-state, and abroad, compared to averages for all companies in the large industries where they belong.

We adjust our model to avoid double-counting in cases where life sciences companies buy inputs from other life sciences companies. For example, medical laboratories may buy medical devices from in-state vendors. We subtract out the indirect and induced impacts of such activity because our industry definition already counts all life science company activity in its direct impacts. For the six NAICS sectors that include life sciences companies, we assume the value of transactions between life sciences companies is proportional to the life sciences industry's share of each sector. The value of these transactions, removed as double-counting, refers to purchases a life sciences company makes from a supplier that is also a life sciences company. Life sciences companies' purchases from their suppliers outside of the life sciences industry are included in economic impacts.

This overview of the Gardner Policy Institute fiscal model supplements the description in Section 2. We use the fiscal model to estimate new state and local revenues and expenditures (see Figure 5.2). The methodology for local revenues and expenditures expanded relative to methodology used in the Gardner Institute's 2018 report on the Life Sciences industry. Previously, revenues and expenses associated with cities and towns were excluded but improved data capture allowed for a more thorough analysis of the local impacts in this report. Additionally, capital expenditure data became available since the last report, allowing for inclusion of the impact to statewide and local capital expenditures in this report. Following the previous methodology would have resulted in an estimated $297.4 million in direct net state and local revenue, $366.7 in indirect and induced net state and local revenue, for a total estimated net positive fiscal impact of $664.1 million in 2022.

Inputs to the fiscal model are employment, personal income, output, and population results produced by the REMI PI+ model based on life sciences industry activity in Utah in 2022. Tax revenue estimates are based on past ratios of historical tax receipts to personal income, industry output, and employment. All government expenditures reported in this memo are estimates based on Utah historical averages for spending per capita, adjusted to 2022 dollars, and overall population estimates and estimates of different age categories associated with the 2022 life sciences industry.

Figure 5.2: Diagram of Fiscal Impact Calculations



*Calculation inputs are total life sciences industry economic impacts, including total direct, indirect, and induced effects from the REMI PI+ economic model.
Source: Kem C. Gardner Policy Institute

Workforce and Growth Trends by State

Based on data availability, results in Section 3 include most—but not all—employee jobs in the life sciences industry. For consistency across states and over time, this analysis does not include self-employed workers or employee counts from handpicked life sciences companies outside of specified industry codes. Also, state-level employment data are incomplete (too low) in some instances due to disclosure protocols for company-reported job counts. However, Sections 1 and 2 are more comprehensive for Utah in 2022 and include self-employed workers, employees from industries with low employment levels, and employees from a list of handpicked companies outside of the updated NAICS industry definition.

In its March 2023 research brief, the Gardner Institute introduced an updated definition for Utah's life sciences industry (see Table 5.3).[38] The industry definition for this analysis includes every company in 17 industries with the following six-digit codes from the 2022 North American Industry Classification System (NAICS): 325411–4, 334510, 334516–7, 339112–5, 423450, 423460, 424210, 541713–4, and 621511.[39] For state comparisons in publications from January 2020 to January 2022, the Gardner Institute used a different ("legacy") definition with 15 industries including NAICS 339116 and omitting NAICS 333314, 424210, and 541713–4.[40]

Compared with the previous ("legacy") definition, the three new industry codes in the updated definition made up 24.7%

Table 5.3: Updated and Legacy Life Sciences Industry Definitions for State Comparisons

(Component Industries with 100% of Companies Counted as Life Sciences; Employee Jobs in 2022)[1]

Code[2]	NAICS Industry Title[2]	Definition[3]		Utah Jobs		U.S. Jobs	
		Legacy	Updated	Number[4]	Share[5]	Number	Share[5]
325411	Medicinal and Botanical Manufacturing	■	■	2,282	6.0%	41,109	2.2%
325412	Pharmaceutical Preparation Manufacturing	■	■	5,112	13.4%	227,403	12.0%
325413	In-Vitro Diagnostic Substance Manufacturing	■	■	ND	ND	31,972	1.7%
325414	Biological Product (except Diagnostic) Manufacturing	■	■	ND	ND	43,796	2.3%
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	■	■	669	1.7%	76,291	4.0%
334516	Analytical Laboratory Instrument Manufacturing	■	■	208	0.5%	48,163	2.5%
334517	Irradiation Apparatus Manufacturing	■	■	1,771	4.6%	14,293	0.8%
339112	Surgical and Medical Instrument Manufacturing	■	■	8,986	23.5%	142,614	7.6%
339113	Surgical Appliance and Supplies Manufacturing	■	■	1,337	3.5%	106,065	5.6%
339114	Dental Equipment and Supplies Manufacturing	■	■	ND	ND	16,455	0.9%
339115	Ophthalmic Goods Manufacturing	■	■	ND	ND	24,088	1.3%
339116	Dental Laboratories	■		1,207	3.2%	44,783	2.4%
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers	■	■	2,594	6.8%	298,153	15.8%
423460	Ophthalmic Goods Merchant Wholesalers	■	■	139	0.4%	22,576	1.2%
424210	Drugs and Druggists' Sundries Merchant Wholesalers		■	3,625	9.5%	253,623	13.4%
541713	Research and Development in Nanotechnology		■	2,282	6.0%	25,294	1.3%
541714	Research and Development in Biotechnology (except Nanobiotechnology)		■	3,544	9.3%	279,886	14.8%
621511	Medical Laboratories	■	■	5,734	15.0%	236,987	12.5%
Total – Legacy Life Sciences Definition (15 NAICS Industries)		■		**30,039**	**78.5%**	**1,374,748**	**72.8%**
Total – Updated Life Sciences Definition (17 NAICS Industries)			■	**38,283**	**100.0%**	**1,888,768**	**100.0%**

NAICS = North American Industry Classification System (2022 version)
ND = Not disclosed (employment not reported for industries with too few companies and/or jobs)
NA = Not applicable (shares omitted for dental laboratories, which is not part of the updated definition)
Notes:

1. Employment includes full- and part-time employee jobs at life sciences companies. These data do not include self-employed workers.
2. Six-digit codes match industry titles for the most disaggregated NAICS industries available. These NAICS industries are components or sub-industries within the life sciences industry (or sector).
3. In January 2023, the Gardner Institute adopted an updated definition for Utah's life sciences industry. The Gardner Institute used its legacy definition for state comparisons in publications from August 2018 through January 2022.
4. A Quarterly Census of Employment and Wages (QCEW) disclosure protocol results in incomplete state-level employment data for Utah and other states. For four industries where the U.S. Bureau of Labor Statistics reported zero Utah employee jobs in 2022, the Utah Department of Workforce Services reported nonzero employment ranges and identified 10 or fewer establishments per industry. An establishment is a business entity or location; companies may have more than one in-state establishment. Total Utah employment for the four industries was 1,612 to 3,278 jobs in 2022 (4.2% to 8.6% of the life sciences industry total under the updated definition). These amounts included 41 to 102 jobs at five establishments in NAICS 325413, 509 to 1,024 jobs at six establishments in NAICS 325414 (with one establishment accounting for 95% to 99% of industry employment), 1,036 to 2,090 jobs at 10 establishments in NAICS 339114 (with one establishment accounting for 92% to 98% of industry employment), and 26 to 62 jobs at three establishments in NAICS 339115. QCEW data would also be under-reported in similar circumstances in other states. Treating amounts that are not disclosed as zero is a methodology limitation. The QCEW offers the most detailed employment data available.
5. Shares are based on the updated definition, with denominators of 38,283 jobs (Utah) or 1,888,768 jobs (U.S.). Shares may not add exactly to 100% due to rounding.

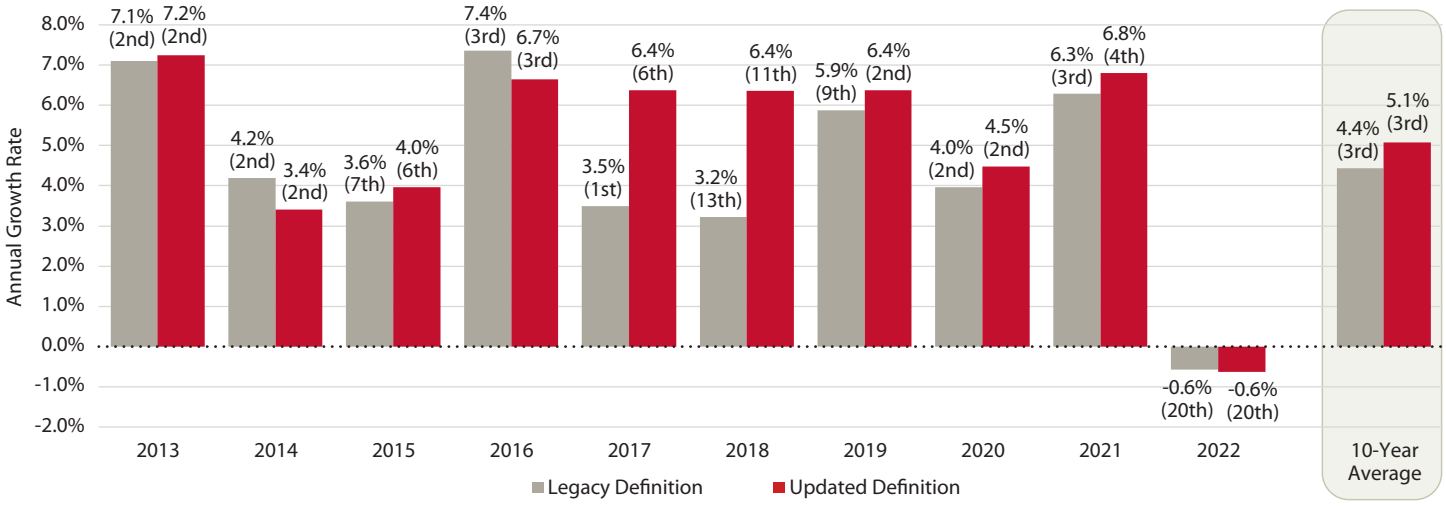
Source: Kem C. Gardner Policy Institute definitions based on a national literature review and input from BioUtah, BioHive, Utah Governor's Office of Economic Opportunity, and Economic Development Corporation of Utah; for employment, Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Table 5.4: Selected Results Comparing Legacy and Updated Definitions for the Life Sciences Industry

Item	Utah (Ranking Among Top 20 States)		U.S.	
	Legacy Definition	Updated Definition	Legacy Definition	Updated Definition
Life Sciences Job Growth Rate (Annual Percent Change in Employment):				
10-Year Average, 2012 to 2022	4.4% (3rd)	5.1% (3rd)	2.7%	3.5%
Five-Year Average, 2017 to 2022	3.7% (11th)	4.6% (9th)	3.9%	4.8%
Single-Year Growth, 2021 to 2022	-0.6% (20th)	-0.6% (20th)	5.1%	5.8%
Life Sciences Share of Workforce (Percent of Total Employee Jobs):				
2012	1.9% (1st)	2.3% (3rd)	1.0%	1.2%
2017	2.1% (1st)	2.5% (2nd)	0.9%	1.2%
2022	2.1% (1st)	2.7% (3rd)	1.1%	1.5%

Note: The Gardner Institute used its previous ("legacy") definition for state comparisons in publications from August 2018 through January 2022. This report and a March 2023 research brief feature an updated definition for Utah's life sciences industry. Based on their 2022 life sciences employment, the same 20 states had the most jobs under either definition. For year-by-year Utah and U.S. job growth rates under the updated definition, see Figures 3.2 and 3.3 and Table 3.1. For annual and state-by-state workforce shares under the updated definition, see Figures 3.5 and 3.6.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Figure 5.3: Utah Life Sciences Job Growth Rate Under Legacy and Updated Industry Definitions, 2013–2022
(Percent Change in Employment Since Previous Year; Utah's Growth Rank Among 20 States with Most Life Sciences Jobs in 2022)



Note: 10-year averages are compound average growth rates from 2012 to 2022. All growth rates are based on employee jobs at life sciences companies, without counting self-employment. The Bureau of Labor Statistics did not disclose Utah employment in NAICS 325413–4 or 339114–5, except partially in 2017 and 2019. Nondisclosure indicates low employment and/or company counts. Due to NAICS system changes in 2017, life sciences employment starting that year may include nanotechnology jobs that are not for nanobiotechnology. Under this incomplete but substantial measure, Utah's life sciences employment rose from 19,476 jobs in 2012 to 30,039 jobs in 2022 for the legacy definition; for the updated definition, industry employment rose from 23,327 jobs in 2012 to 38,283 jobs in 2022. For details on legacy and updated definitions, see Table 5.3.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

of Utah's life sciences employment in 2022: NAICS 424210 (wholesale pharmaceuticals), 541713 (research and development in nanotechnology), and 541714 (research and development in biotechnology). The updated definition leaving out NAICS 339116 (dental laboratories) from the legacy definition affects what would be 3.2% of 2022 life sciences employment under the updated definition.[41] The net effect of adding three NAICS codes and removing one was to increase 2022 life sciences employment by 21.5% in Utah and 27.2% in the U.S.

Meanwhile, the Gardner Institute's August 2018 life sciences report and the Institute's chapters in the 2020 and 2022 Economic Report to the Governor used a more comprehensive version of the legacy definition.[42] Single-year Utah-only results in these three publications included many large, handpicked life sciences companies outside of the industries identified as 100% life sciences under the legacy definition. The three publications also included jobs for self-employed workers (life sciences proprietorships). Sections 1 and 2 feature a more comprehensive version of the expanded definition, also including handpicked companies and self-employment. The Gardner Institute is unable to replicate this level of detail for other states.

To illustrate how the updated definition measures industry growth and specialization differently, Table 5.4 presents six key findings under the legacy definition as well. For example, Utah's average job growth rate from 2017 to 2022 was 3.7% per year (11th among states) under the legacy definition

Table 5.5: STEM Degrees Awarded in the Utah System of Higher Education, 2021
(Degree Completions)

Program	CIP Code	Count	Share
Computer and Information Sciences and Support Services	11	2,016	24.2%
Engineering	14	1,520	20.9%
Biological and Biomedical Sciences	26	1,065	18.7%
Physical Sciences	40	439	5.6%
Engineering/Engineering-Related Technologies/Technicians	15	408	3.9%
Mathematics and Statistics	27	380	6.6%
Psychology	42	367	4.1%
Social Sciences	45	273	2.9%
Business, Management, Marketing, and Related Support Services	52	235	2.5%
Natural Resources and Conservation	03	209	2.3%
Agricultural/Animal/Plant/Veterinary Science and Related Fields	01	168	2.1%
Multi/Interdisciplinary Studies	30	89	1.2%
Health Professions and Related Programs	51	83	1.2%
Architecture and Related Services	04	71	0.7%
Transportation and Materials Moving	49	68	0.9%
Education	13	63	0.9%
Science Technologies/Technicians	41	60	0.6%
Communications Technologies/Technicians and Support Services	10	22	0.4%
Homeland Security, Law Enforcement, Firefighting and Related Protective Services	43	17	0.2%
Military Technologies and Applied Sciences	29	9	0.2%
Total		**7,562**	**100.0%**

CIP = Classification of Instructional Programs (2020)
Note: Completions are for associate, bachelor's, and graduate degrees from science, technology, engineering, and mathematics (STEM) programs at colleges and universities in the Utah System of Higher Education. STEM completions include all awards from programs in CIP codes 14, 26, 27, and 40, and awards only from certain programs in the 16 remaining CIP codes. This information for the 2021 academic year covers from July 1, 2020 to June 30, 2021.
Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System; STEM program definitions from the U.S. Department of Homeland Security, STEM Designated Degree Program List

and 4.6% per year (9th among states) under the updated definition.[43] Rankings are for the 20 states with the most life sciences employment in 2022. Industry workforce shares were consistently higher under the updated definition. For example, Utah's specialization in life sciences in 2012 amounted to 1.9% of the workforce according to the legacy definition versus 2.3% under the updated definition. Figure 5.3 shows annual growth rates for both definitions.

The U.S. Bureau of Labor Statistics (BLS) publishes data on employee jobs at the state level. The data tally full- and part-time employee jobs by NAICS industry and calendar year. BLS data reflect company-reported average employment levels over 12 months.

BLS data underreport life sciences employment somewhat for Utah and, likely, several other states. The BLS does not disclose annual employment at the state level for six-digit NAICS industries with low employment levels and few establishments. In 2022, non-disclosed data amounted to 4.2% to 8.6% of total employee jobs in Utah's life sciences industry (see Table 5.3 note 4).[44] The effects of BLS disclosure protocols are not limited to Utah among the 20 states with the largest life sciences employment. Underreporting is unevenly distributed: states with more life sciences jobs are less likely to have a disclosure issue for a component NAICS industry. The nondisclosure issue is not present in custom data requests to the Utah Department of Workforce Services, the Gardner Institute source for in-depth reports, the present one and the inaugural one from August 2018.[45] However, the more comprehensive treatment of those is not feasible for multiple states or prior years.

Student Learning Analysis

In the Utah System of Higher Education during the 2020–2021 academic year, STEM degrees were awarded across 68 majors or fields in 20 categories, as defined by two-digit codes under the 2020 Classification of Instructional Programs (CIP).[46] The three most common categories saw more than 1,000 degree completions each, collectively 60.8% of STEM awards that year: computer and information sciences and support services (CIP code 11), engineering (14), and biological and biomedical sciences (26) (see Table 5.5).

The U.S. Department of Education (ED) developed the CIP taxonomy of academic programs and updates it each decade. Colleges and universities assign CIP codes to their academic programs. For academic years prior to 2020, the authors used ED crosswalks to convert the STEM definition from the 2020 CIP to the 2010 and 2000 CIP taxonomies.[47]

Endnotes

1. See Pace, L. & Brandley, A. (2023, March). Utah's Life Sciences Workforce and Industry Growth: 2012 to 2021. Kem C. Gardner Policy Institute. https://gardner.utah.edu/wp-content/uploads/LifeSciences-RB-Mar2023.pdf
2. See Pace, L. & Spolsdoff, J. (2018, August). Economic Impacts of Utah's Life Sciences Industry. Kem C. Gardner Policy Institute. https://bioutah.org/wp-content/uploads/2019/08/Aug2018-LifeSciencesReport.pdf
3. NAICS definitions update every five years. This analysis relied on crosswalk information to move between the 2012 NAICS system and the 2017 NAICS system. The 2017 version created NAICS 541713, Research and Development in Nanotechnology, and NAICS 541714, Research and Development in Biotechnology (except Nanobiotechnology), from two 2012 NAICS industries—all of NAICS 541711, Research and Development in Biotechnology, and part of NAICS 541712, Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology). Starting in 2022, Bureau of Labor Statistics data follow the 2022 NAICS system.
4. For publications from 2018 to 2022, the Gardner Institute used a different ("legacy") definition with 15 industries including NAICS 339116 and omitting NAICS 333314, 424210, and 541713–4. See Pace, L. & Spolsdoff, J. (2018, August). Economic Impacts of Utah's Life Sciences Industry. Kem C. Gardner Policy Institute. https://bioutah.org/wp-content/uploads/2019/08/Aug2018-LifeSciencesReport.pdf; Pace, L. (2020, January). "Life Sciences Industry." In Utah Economic Council (2020). Economic Report to the Governor: 2020 (pp. 149–152). Utah Economic Council, David Eccles School of Business, University of Utah. http://gardner.utah.edu/wp-content/uploads/ERG2020.pdf; Burton, L. & Pace, L. (2021, August). Growth Trends in Utah's Life Sciences Industry. Kem C. Gardner Policy Institute. https://gardner.utah.edu/wp-content/uploads/LifeSci-FS-Aug2021.pdf; and Pace, L. (2022, January). "Life Sciences." In Utah Economic Council (2022). Economic Report to the Governor: 2022 (pp. 141–144). Utah Economic Council, David Eccles School of Business, University of Utah. https://gardner.utah.edu/wp-content/uploads/ERG2022-Full.pdf
5. The Quarterly Census of Employment and Wages (QCEW) is a source of administrative data based on required reporting by all employers with workers covered by state unemployment insurance. (The QCEW data also include federal government employees who are covered by the Unemployment Compensation for Federal Employees program. The Gardner Institute's life sciences industry definition is within the private sector and does not include federal workers.) Employers with covered workers identify their establishments (separate entities or locations) and provide monthly job counts and aggregate wage amounts. The Utah Department of Workforce Services (DWS) administers the QCEW program in the state of Utah as part of the national QCEW program administered by the U.S. Bureau of Labor Statistics. DWS publishes QCEW data online, for example through its FirmFind tool. See Utah Department of Workforce Services. (n.d.). Utah Economic Data Viewer. https://jobs.utah.gov/jsp/utalmis/#/ (which includes a Glossary of Terms that lists QCEW) and U.S. Bureau of Labor Statistics. (2022, August). Quarterly Census of Employment and Wages: About QCEW. https://www.bls.gov/cew/overview.htm.
6. In 2021, the Salt Lake City MSA's medical devices and diagnostics employment of 10,990 jobs ranked seventh among 384 MSAs in the U.S., after San Francisco and San Diego and before Chicago and San Jose. Utah's only other top 20 ranking, Salt Lake City's research, testing, and medical laboratories industry group, was 13th, after the Durham-Chapel Hill and Baltimore-Columbia-Towson MSAs and before Houston and Miami. Utah's other four MSAs were not ranked in 2022. See TEConomy Partners. (2022). *The U.S. Bioscience Industry: Fostering Innovation and Driving America's Economy Forward.* Biotechnology Innovation Organization. https://go.bio.org/rs/490-EHZ-999/images/TEConomy_BIO_2022_Report.pdf. While the Gardner Institute's life sciences industry segments align well with those in the Biotechnology Innovation Organization' report, the Gardner Institute's "medical devices and diagnostics" segment is labeled "medical devices and equipment" in the report.
7. Employee jobs and wages are reported by life sciences companies. The Gardner Institute estimated employee benefits, self-employment jobs, and proprietors' income based on actual life sciences employee jobs and wages, as well as Utah data by industry for employee-compensation-to-wage ratios, self-employment rates, and proprietors' income per worker.
8. In 2022, the life sciences industry directly provided 2.3% of Utah jobs, including company employees and self-employed workers (see Figure 2.1). The somewhat higher 2.8% share from the bottom row of Table 1.6 represents employees but no self-employment. The difference suggests that the life sciences industry provided proportionately fewer self-employment opportunities than did other industries in Utah.
9. Life sciences employment in 2022 was between 1 and 103 jobs in the 11 counties for which the Utah Department of Workforce Services was unable to disclose life sciences wages due to the small establishment count (one or two per county).
10. In Iron County, the life sciences share of employee jobs (0.22%) was higher than the industry's share of wages in the county (0.18%).
11. Saratoga Springs and Springville had nine life sciences establishments each; Farmington and North Salt Lake had eight; Centerville and Holladay had seven; Clearfield had six; and Kamas had five. As for Utah municipalities with fewer than five life sciences establishments, 11 municipalities had four establishments, eight municipalities had three establishments, 17 municipalities had two establishments, and 29 municipalities had one establishment.
12. Based on adults living in Utah at the time of survey (2017-2021) who were employed in the previous five years. Kem C. Gardner Policy Institute analysis of data from the American Community Survey, U.S. Census Bureau; Integrated Public Use Microdata Series, University of Minnesota
13. Economic impact percentages are provided for context and a sense of magnitude. Total economic impact percentages are not shares that add to a meaningful 100% with consistent units. Rather, each percentage represents a ratio of combined direct, indirect, and induced economic impacts (numerator) to total direct economic activity in Utah's economy (denominator). Utah industries, including life sciences, are interdependent and have overlapping economic impacts. Statewide measures of direct economic activity in all industries would add to 100%.
14. We grouped standard NAICS industries to create the simplified industries in Figure 2.2 and Table 2.1. The real estate industry includes rental and leasing. The professional services industry includes scientific and technical services. The business services industry includes administrative and waste management services, as well as management of companies and enterprises. The education and health industry does not include public education (included in government) but does include social services. The transportation and utilities industry includes warehousing. The other services industry does not include public administration. The natural resources industry includes mining, as well as farm, forestry, fishing, and related activities. Leisure and hospitality includes arts, entertainment, and recreation as well as accommodation and food services. Government impacts were in state and local government, not federal.
15. Many company changes affect a state's employment in a particular year, including layoffs, hiring, relocating, and industry reclassifications. Cytiva (formerly HyClone) is a Logan, Utah therapeutics and pharmaceutical company that reclassified from the industry "electromedical and electrotherapeutic apparatus manufacturing" (NAICS 334510) in 2021 to "biological product (except diagnostic) manufacturing" (NAICS 325414) in 2022. NAICS refers to the North American Industry Classification System under which companies self-identify by their primary business activity. Both industries are among the 17 NAICS industries included in the life sciences definition for this section, but the U.S. Bureau of Labor Statistics (BLS) did not disclose Utah employment for NAICS 325414 either year. In 2021 and 2022, Cytiva maintained 500 to 999 Utah jobs according to the Utah Department of Workforce Services.
16. Annual venture capital totals are in current dollars, not adjusted for inflation, rounded to the nearest $0.1 billion. See TEConomy Partners (2022), pp. 31 and 34.
17. Biotechnology Innovation Organization (BIO) published state-level workforce specialization findings based on location quotients, which measure the ratio of state industry employment shares to the national average. A state location quotient of 1.00 indicates life sciences specialization equal to the national average; a location quotient above 1.00 indicates above-average specialization in a state, and a location quotient below 1.00 indicates below-average specialization. For three life sciences segments, Utah's location quotient was 1.20 or higher. The biosciences-related distribution segment's location quotient was between 1.00 and 1.20. Precise Utah location quotients were not published. Gardner Institute and BIO segments for life sciences align well, but the Institute's "medical devices and diagnostics" segment is labeled "medical devices and equipment" in the BIO report, and the Institute's "therapeutics and pharmaceuticals" segment is simply "pharmaceuticals" to BIO. See TEConomy Partners. (2022). The U.S. Bioscience Industry: Fostering Innovation and Driving America's Economy Forward. Biotechnology Innovation Organization. https://go.bio.org/rs/490-EHZ-999/images/TEConomy_BIO_2022_Report.pdf
18. Gardner Institute definitions for life sciences segments are similar to the 2022 TEConomy Partners report's "bioscience subsector" definitions, and we discuss its findings using Gardner Institute segment names. TEConomy's "medical devices and equipment" subsector has six of seven NAICS industries in the Gardner Institute's "medical devices and diagnostics" segment, missing only "ophthalmic goods manufacturing" (NAICS 339115). TEConomy's "research, testing, and medical laboratories" subsector includes all three NAICS industries in the Gardner Institute's segment by the same name. However, the TEConomy study takes only part of the industry "research and development in nanotechnology" (NAICS 541713) for this subsector and adds parts of the industries "testing laboratories" (541380) and "research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)" (541715). TEConomy's "pharmaceuticals" subsector has the same definition as the Gardner Institute's "therapeutics and pharmaceuticals" segment. TEConomy's "bioscience-related distribution" subsector takes only part of two industries in the Gardner Institute's "biosciences-related distribution" segment: "medical, dental, and hospital equipment and supplies merchant wholesalers (NAICS 423450) and "drugs and druggists' sunrise merchant wholesalers" (424210); TEConomy omits the industry "ophthalmic goods merchant wholesalers" (423460), which is included in the Gardner Institute segment; and TEConomy includes part of the industry "farm supplies merchant wholesalers" (424910), which is not in the Gardner Institute's "biosciences-related distribution." Finally, TEConomy has a fifth subsector, "agriculture feedstock and industrial biosciences," which is not part of the Gardner Institute's life sciences industry definition.
19. Salt Lake City MSA's employment location quotients in 2021 by segment were 5.22 for medical devices and equipment; 2.66 for research, testing, and medical labs; greater than 1.20 (not specified) for pharmaceuticals; and 1.07 for bioscience-related distribution (TEConomy Partners, 2022, pp. 46, 49). Total private employment in employee jobs in 2021 by MSA is from the U.S. Bureau of Labor Statistics, Current Employment Statistics, State and Metro Area Employment, Hours, and Earnings at https://www.bls.gov/sae/data/.
20. Employment location quotients by segment in 2021 were 3.47 for Ogden-Clearfield MSA pharmaceuticals, 3.35 for Provo-Orem MSA pharmaceuticals, 2.60 for Ogden-Clearfield MSA medical devices and equipment, and 1.89 for Provo-Orem MSA bioscience-related distribution (TEConomy Partners, 2022, pp. 43, 46, 52).

21. Logan MSA's employment location quotients by segment in 2021 were 4.55 for medical devices and equipment and 1.26 for research, testing, and medical labs (TEConomy Partners, 2022, pp. 46, 49).
22. Details about which academic programs are defined as STEM are available in Section 5 under Student Learning Analysis.
23. The student learning subsection documents associate, bachelor's, and graduate degrees awarded by eight public colleges and universities in the Utah System of Higher Education (USHE). The results do not include private institutions or technical colleges. Among Utah's private institutions, Brigham Young University, Western Governors University, and Westminster University award significant numbers of STEM degrees. Eight USHE technical colleges and multiple private institutions in Utah offer certificate programs and training in fields essential to life sciences research, manufacturing, and business operations.
24. Due to rounding, differences between years for STEM shares of all degree completions in Table 4.2 may not exactly match percentage point changes for colleges and universities in this paragraph.
25. FY 2022 percentages are by award type calculated from USAspending.gov data. National Institutes of Health (NIH) funding reported by USAspending was 98.2% of the FY 2022 total reported directly by NIH, near the five-year average of 98.6% for FY 2018 to FY 2022. See USAspending.gov. (2023, June). Spending by Time. https://www.usaspending.gov/search
26. Section 4 described nine NIH institutes with more than $50 million (up to $212.5 million) each in grants and other Utah awards from FY 2018 to FY 2022. An additional 10 institutes and centers with at least $10 million in Utah awards during these years provided another 16.2% of all NIH funding in Utah. The additional institutes and centers address aging; deafness and other communication disorders; biomedical imaging and bioengineering; mental health, translational sciences for diagnostics and therapeutics; the dissemination of biomedical science information; arthritis and musculoskeletal and skin disorders; genomics; complementary and integrative health interventions; and dental and craniofacial diseases and disorders. Similar information about health applications was not available for 9.0% of Utah NIH funding awarded from FY 2018 to FY 2022. For information on the 27 institutes and centers that make up NIH and fund biomedical and behavioral research, training, and education, see U.S. Department of Health and Human Services. (2023, July 12). List of Institutes and Centers. National Institutes of Health. https://www.nih.gov/institutes-nih/list-institutes-centers. Data on NIH funding by institute and center are from USAspending.gov.
27. In February and March 2023, the Gardner Institute requested data on life sciences innovation from Brigham Young University, the University of Utah, and Utah State University. The dialogue and follow-up with these universities continued through August 2023. They are the only universities in the state with long-standing doctoral programs and high levels of research activity. Starting in 2020 and 2021, Weber State University and Westminster University also began awarding doctoral degrees, although none were in STEM fields. While Brigham Young University's technology transfer office is supportive of this study, its staff was unable to provide the requested data before publication.
28. See American Council on Education. (2021). Carnegie Classification of Institutions of Higher Education. Indiana University Center for Postsecondary Research. https://carnegieclassifications.acenet.edu/institutions/
29. Section 4 includes nearly all life sciences innovation at the University of Utah. PIVOT Center data updates are ongoing for previous years. University of Utah data the authors received in June and July 2023 for Table 4.4, Figure 4.6, and invention disclosures in Figure 4.7 represent 96.6% of all 827 life sciences patents issued from 2018 to 2022, as recorded through September 21, 2023. Likewise, data coverage shares for life sciences invention disclosures, license agreements, and startups are likely very large. Meanwhile, patent data for Figure 4.7 received September 7, 2023 covers 99.8% of the 827 patents issued in life sciences.
30. During the academic years 2018 to 2022 at Utah State University, 78.9% of license agreements (15) were in digital health, with the remaining 21.1% (4) in biotechnology. The only life sciences business startup during these years was in biotechnology. Detailed categorization for patents, licensing, and startups was not available for the University of Utah.
31. U.S. shares exclude patent awards for the categories "plants" and "agricultural chemicals." During the calendar years 2018 through 2021, five categories accounted for the remaining 18.4% of patent awards for life sciences inventions in any setting, research university or elsewhere: microbiology and enzymes (7.6%), bioinformatics and health IT (3.8%), biological sampling and analysis (3.8%), genetics (3.1%), and biopolymers (0.1%). See TEConomy Partners. (2022). The U.S. Bioscience Industry: Fostering Innovation and Driving America's Economy Forward. Biotechnology Innovation Organization. https://go.bio.org/rs/490-EHZ-999/images/TEConomy_BIO_2022_Report.pdf
32. See Pace, L. & Brandley, A. (2023, March). Utah's Life Sciences Workforce and Industry Growth: 2012 to 2021. Kem C. Gardner Policy Institute. https://gardner.utah.edu/wp-content/uploads/LifeSciences-RB-Mar2023.pdf
33. See Cambia Grove. (2020). Health Care Innovation Landscape Report: Utah. Retrieved June 2020. https://www.cambiahealth.com/news-and-stories/resources; Economic Development Corporation of Utah. (2023, June). Life Sciences in Utah: FY23–24. EDCUtah industry profile. https://www.edcutah.org/research/research-main; TEConomy Partners (2022); California Life Sciences. (2021). Sector Report 2021. https://info.califesciences.org/hubfs/Sector%20Report_FINAL.pdf; TEConomy Partners (2022, April). Essential: The Impact of the Healthcare and Life Sciences Sector in Indiana. https://biocrossroads.com/2021-indiana-life-sciences-capital-report-2/; MassBio. (2022). Industry Snapshot. Massachusetts Biotechnology Council. https://www.massbio.org/industry-snapshot/; Ohio Life Sciences Foundation. (2022, November). The Ohio Life Sciences Report. https://www.bioohio.com/ohio/report-download/; TEConomy Partners (2021, February). Evidence & Opportunity: 2020 Impact of Life Sciences in North Carolina. North Carolina Biotechnology Center. https://www.ncbiotech.org/sites/default/files/inline-files/NCBiotech%20Evidence%20%26%20Opportunity%202020%20-%20vFinal_0.pdf
34. Ruggles, S., Flood, S., Goeken, R., Sobek, M., Brockman, D., Cooper, G., Richards, S., & Schouweiler, M. (2023). IPUMS USA: Version 13.0 American Community Survey, 5-Year Sample, 2017 to 2021. University of Minnesota. https://usa.ipums.org
35. For titles and descriptions of NAICS industries with four or six digits, see U.S. Census Bureau. (2023, August). North American Industry Classification System: 2022 NAICS. https://www.census.gov/naics/?58967?yearbck=2022
36. U.S. Bureau of Labor Statistics. (2022, February). Occupational Employment and Wage Statistics. https://www.bls.gov/oes/topics.htm#stem
37. This import substitution logic would generally not apply to an analysis of the economic impact to a state of a single company with many in-state competitors, since in-state buyers could readily find alternatives without buying from outside the state.
38. See Pace and Brandley (2023). In January 2023, the Gardner Institute introduced an earlier version of the updated definition that omitted NAICS 541713, Research and Development in Nanotechnology, and included NAICS 333314, Optical Instrument and Lens Manufacturing (see Brandley and Pace, 2023). Further analysis and industry dialogue indicated that NAICS 541713 was almost entirely nanobiotechnology in Utah as of 2021, though perhaps not in some other states. Meanwhile, NAICS 333314 had fewer than 25 jobs in 2021 and did not crosswalk intact from the 2017 NAICS system into the 2022 NAICS system.
39. NAICS definitions update every five years. This analysis relied on crosswalk information to move between the 2012, 2017, and 2022 NAICS systems. The 2017 version created NAICS 541713, Research and Development in Nanotechnology, and NAICS 541714, Research and Development in Biotechnology (except Nanobiotechnology), from two 2012 NAICS industries—all of NAICS 541711, Research and Development in Biotechnology, and part of NAICS 541712, Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology). The 2022 NAICS system did not involve noteworthy changes in any of the 17 NAICS industries in the updated definition for life sciences.
40. See Pace, L. (2020, January). "Life Sciences Industry." In Utah Economic Council. (2020). Economic Report to the Governor: 2020 (pp. 149–152). Utah Economic Council, David Eccles School of Business, University of Utah. http://gardner.utah.edu/wp-content/uploads/ERG2020.pdf; Burton, L. & Pace, L. (2021, August). Growth Trends in Utah's Life Sciences Industry. Kem C. Gardner Policy Institute. https://gardner.utah.edu/wp-content/uploads/LifeSci-FS-Aug2021.pdf; and Pace, L. (2022, January). "Life Sciences." In Utah Economic Council. (2022). Economic Report to the Governor: 2022 (pp. 141–144). Utah Economic Council, David Eccles School of Business, University of Utah. https://gardner.utah.edu/wp-content/uploads/ERG2022-Full.pdf
41. The value of 3.0% is offered as a ratio, since NAICS 339116 from the legacy definition is not included in the denominator of the implied employment fraction for 2021. The ratio was calculated as Utah employee jobs at dental laboratory companies divided by Utah employee jobs at companies in 17 other NAICS codes under the updated life sciences definition.
42. See Pace and Spolsdoff (2018); Pace (2020); Pace (2022).
43. Multi-year average growth rates represent state trends in life sciences industry employment more clearly than single-year growth rates. As states' annual job growth in the life sciences industry are volatile (see Section 3 and endnote 15), so state rankings based on these growth rates are noisy. From 2013 to 2022 in the largest 20 states by 2022 life sciences employment, 14 states had a top-three annual growth rate for at least one year, 14 states spent at least one year ranked in the bottom three, and 11 states met both criteria.
44. Utah Department of Workforce Services. (2023, March). Firm Find. September 2022 dataset. https://jobs.utah.gov/jsp/firmfind/
45. See Pace and Spolsdoff (2018).
46. See U.S. Department of Homeland Security. (2022, January 21). DHS STEM Designated Degree Program List. https://www.ice.gov/doclib/sevis/pdf/stemList2022.pdf
47. See National Center for Education Statistics. (n.d.). The Classification of Instructional Programs: Crosswalk 2000-2010. U.S. Department of Education. https://nces.ed.gov/ipeds/cipcode/resources.aspx?y=55 and National Center for Education Statistics. (n.d.). The Classification of Instructional Programs: Crosswalk 2010-2020. https://nces.ed.gov/ipeds/cipcode/resources.aspx?y=56

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