



Oregon Bioscience Association

Oregon's Bio Boom 2022 Economic Impact Report

Measuring the Economic, Fiscal and Demographic Impacts of Oregon's Bioscience Industry including Clark County, Washington

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Dear Colleagues,

With the mission of hope, health and healing, the framework of our region's bioscience ecosystem continues its upward trend by nearly every indicator. The upshot: Oregon's 1,480 life science firms and leading academic and research institutions generated total economic impact of almost 66,000 jobs and \$15.7 billion in output, creating more than \$600 million in local tax and fee revenues.

As we've long held bioscience is, by nearly every measure 'recession proof,' we intentionally cast our net throughout the ecosystem during a most strenuous time: the first year during the SARS-CoV2 pandemic. Our industry – not only locally but around the world – rose fast to answer the needs of the pandemic in 2020 and since.

Here, our data dive into private bioscience and life science research and focus on the first full year of the pandemic in 2020, thus underscoring the resilience of our industry, its scientists, labs, startups, growth stage companies, funders, leaders, policymakers and the rapidly rising rate of influx of public and private sector dollars into Oregon and southwest Washington, specifically Clark County. Indications are this trend continues as this chart shows.

To put a finer point on the data you'll discover here, our industry ripples with both buoyancy and halo. In this round of data, we note a higher economic multiplier for both overall employment and income than most other industries in Oregon.

And we've taken to opportunity to show a running historical purview comparing the upward growth since our first measurements in 2002, showing an 85 percent increase in private jobs and 123 percent growth in life science research employment in Oregon. This year we also made measurement in Clark County, Washington.

This year's Economic Impact Report: Oregon's Bio Boom outlines these and many other measures of success. While Oregon's biotechnology and life sciences sectors have done well, we must continue to inspire a supportive and collaborative environment in our region, encouraging bioscience companies to start, grow and stay here. Oregon Bioscience Association is working with industry, academia and policymakers to streamline and model regulations, increase education and research funding, improve the tax climate and deliver other policy changes that will advance health innovation and preserve patients' access to care and therapies. Thank you for being part of such success.

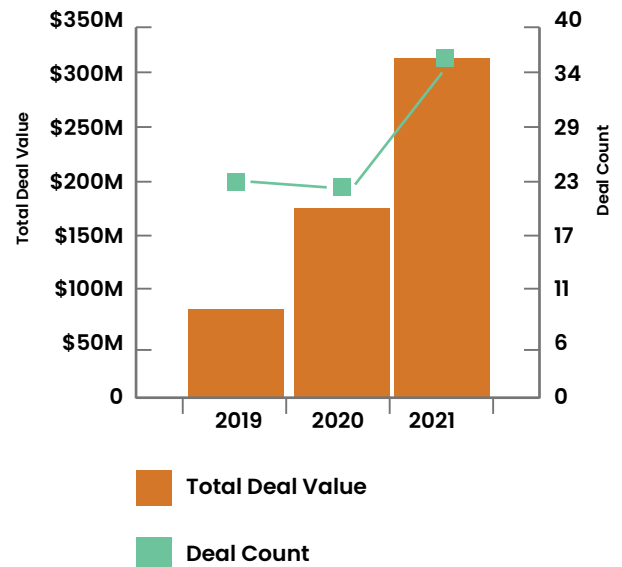
Sincerely,



Liisa Bozinovic, Executive Director

VC Investment

Annual value and count of venture capital deals with health care firms based in Oregon and S.W. Washington



Source: 2021 Pitchbook and the Portland Business Journal



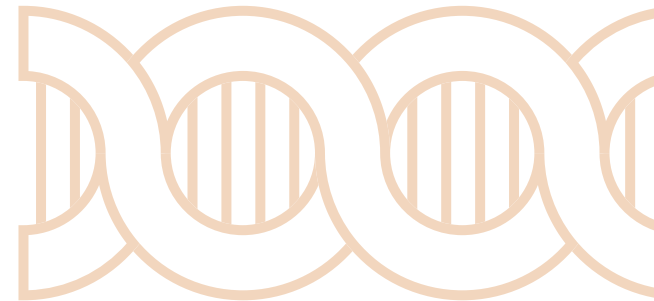
TABLE OF CONTENTS

Executive Summary	4
Key Findings	4
Modeling Approach	10
Input-Output Modeling	10
Economic Impact Measures	11
The Bioscience Industry in Oregon	12
Private Bioscience in Oregon	12
Defining Private Bioscience	12
Private Bioscience Direct Impacts in Oregon in 2020	14
Total Impacts of Private Bioscience in Oregon in 2020.....	24
Life Science Research in Oregon.....	29
Defining Life Science Research	29
Direct Impacts of Life Science Research in Oregon in 2020	29
Total Impacts of Life Science Research in Oregon in 2020	33
The Bioscience Industry (Combined) in Oregon, 2020	37
Direct Impacts of the Bioscience Industry in Oregon, 2020.....	37
Total Impacts of the Bioscience Industry in Oregon, 2020.....	41
The Bioscience Industry in Clark County, Washington	44
Direct Impacts of Private Bioscience and Life Science Research in Clark County in 2020 .	44
Appendix	51

Pinnacle Economics, Inc.,¹ (Pinnacle) was engaged by the Oregon Bioscience Association to measure the economic, fiscal, and demographic impacts of the bioscience industry in Oregon in 2020. This represents the sixth such study, and updates previous efforts that measured the bioscience industry in 2002, 2007, 2009, 2014, and 2017.² This study also expands its geographic scope to include Clark County, Washington. Similar to previous studies, the bioscience industry consists of the following two general categories:

1. Private bioscience represents bioscience-related activities carried out by private companies within five industry sectors: 1) agricultural feed stocks and chemicals manufacturing, 2) drugs and pharmaceutical manufacturing, 3) medical devices and equipment manufacturing, 4) research, testing, and medical laboratories, and 5) bioscience-related distribution. These industry sectors are in alignment with TEconomy Partners, LLC., and Biotechnology Innovation Organization's 2020 industry definition.³
2. Life science research at universities and hospitals.

To quantify the direct economic impacts (or dimensions) of the bioscience industry, Pinnacle relied on detailed, firm-level wage and employment data from the Oregon Employment Department (OED) and aggregated wage and employment data from the Washington Employment Security Department (ESD), as well as funding, expenditure, payroll and employment data gathered by Oregon Bio from research universities and hospitals in Oregon and Clark County.⁴ These direct measures were then augmented with additional data from an economic impact models of Oregon and Clark County developed using the IMPLAN software. The total economic impacts or contributions of the bioscience industry are larger than the industry itself because bioscience spending and incomes generate additional economic activity in other sectors of the economy. That is, the total economic impacts of the bioscience industry in Oregon and Clark County include the direct economic activity plus secondary or multiplier effects generated as a result of supply-chain (indirect impacts) and consumption-driven (induced impacts) spending in other industries. These multiplier effects were measured using IMPLAN economic impact models of the Oregon and Clark County economies in 2020.



¹Alec Josephson, economist and president of Pinnacle Economics, is the sole author of this report. With 30 years of economic consulting experience, Mr. Josephson is a nationally recognized expert in economic impact analysis and has directed, conducted, and/or authored well over 1,000 economic impact studies. See www.pinnacleecon.com.

²Caution must be exercised with time series analyses, especially with structural or definitional changes in industries (QCEW data) or the input-output modeling framework (IMPLAN). According to OED, "Occasionally employment levels in a QCEW dataset will suddenly shift for reasons unrelated to true economic change." These reasons include boundary changes, changes in geocoding methodology, non-economic code changes, and multiple worksite reporters. (See OED's "Annual Geocoded QCEW Data File User's Guide & Data Dictionary," September, 2021.) Pinnacle and Oregon Bio worked with OED economists at the beginning of this project to better understand potential changes to the underlying QCEW data, especially with respect to some firms not having complete Oregon location data. OED confirmed that these businesses reported working in Oregon but may not have address data because they do not have a "brick and mortar" location, e.g., an employee working remotely from their Oregon residence for a company located outside of Oregon. In addition, the newer IMPLAN modeling framework has more industry sectors than the model used in the previous report, and this is especially relevant for bioscience-related distribution where the expanded IMPLAN sectoring framework went from one wholesale trade sector to nine wholesale trade sectors. While this change will affect the underlying economic impact numbers, it will also likely improve the reliability of the multiplier effects estimated by the IMPLAN model for this private bioscience sector.

³The private bioscience industry is defined using North American Industry Classification System (NAICS) codes originally developed in Battelle and Biotechnology Innovation Organization (BIO) national studies conducted for 2006, 2007, 2010, and 2012. This definition was updated by TEconomy Partners, LLC., and BIO in their 2014 study and continues in their most recent 2020 study. See TEconomy/BIO, *The Bioscience Economy: Propelling Life-Saving Treatments, Supporting State & Local Communities, 2020*.

⁴Clark County is included in this report to more fully quantify the bioscience industry in the larger, greater Portland area where business linkages and commuter flows between states are significant.



KEY FINDINGS

Grace Bio Labs manufactures products for the global vaccine research community. During the pandemic, our industry faced raw material shortages, supply chain delays and most importantly – our employees’ ability to work in the labs while juggling care for family members during closures. Our team at Grace Bio Labs quickly pivoted our resources, schedules and raw materials. We flexed laboratory schedules to meet required social distancing which also allowed employees to accommodate family care needs. Our team developed a new product line with our raw materials critical to front line workers in local hospitals.

Lisa Hale – CEO, Grace Bio Labs, Bend, Oregon

Private bioscience consisted of 1,480 establishments that directly generated \$7.6 billion in output and employed 16,820 workers who received \$1.5 billion in wages. Adding in payroll taxes and other benefits, the total income for employees in private bioscience was over \$1.8 billion. Private bioscience generated \$1.4 billion in other income such as profits, royalties, rents and dividends. With \$4.4 billion in exports (58 percent of industry output), private bioscience brings “new” money to the state. In 2020, private bioscience firms and employees directly generated \$245.9 million in tax and fee revenues for state and local governments.

- According to OED data, the average annual wage in private bioscience was \$88,440 or 50 percent greater than the statewide average wage (\$58,966) for private sector employment in 2020.
- Private bioscience exists in nearly every Oregon county and is well represented outside of the three-county Portland area. In 2020, 535 private bioscience firms are known to be located outside of Portland, and they employed 6,640 persons and generated \$481.1 million in wages.⁵
- Since the first study for 2002, private bioscience employment increased 85 percent (+5,270 jobs), total wages increased 215 percent (+\$593.4 million), and average annual wages increased 71 percent (+\$31,340).⁶ This robust growth across all direct measures is not unexpected, as private bioscience has exhibited steady growth in employment and wages across all six studies.⁷

Table ESI

Bioscience Direct Impacts by Sector (\$ millions*)

Measure	Private Bioscience	Life Science Research	Total Bioscience
Jobs	16,820	5,870	22,690
Output*	\$7,560.5	\$882.3	\$8,442.9
Income*	\$1,804.0	\$643.8	\$2,447.8
• Wages*	\$1,487.6	\$522.8	\$2,010.4
Other Income*	\$1,417.7	\$81.4	\$1,499.1
Exports*	\$4,357.9	\$83.7	\$4,441.6
Average Annual Wage	\$88,440	\$89,074	\$88,604
State and Local Tax and Fee Revenues*	\$245.9	\$45.0	\$291.0
Federal Tax and Fee Revenues*	\$420.3	\$132.6	\$552.9

By accelerating the creation of new bioscience startup companies in the Willamette Valley, we advance a more connected local ecosystem where companies can grow and thrive right here. Building the right bridges from academia to launch to commercialization to growth, we embody job creation that endues a high economic multiplier effect. Our Oregon ecosystem offers jobs paying an average of \$88,440 annually. With programs like the EUG Launchpad Accelerator, Onward Career Tours, and On-the-Job Training, we are also making these high-paying jobs increasingly accessible to everyone.

–Matt Sayre, Managing Director at Onward Eugene, Oregon

⁵OED location data is not available for some establishments known to be operating in Oregon in 2020.

⁶These changes were estimated after controlling for Battelle/BIO’s revised definition of private bioscience in 2014, i.e., bioscience-related distribution and some bioscience subsectors are not included.

⁷For comparison, all private industries in Oregon show a 19 percent increase in employment and a 112 percent increase in total wages between 2002 and 2020. In addition, compared to other Oregon industry sectors at the 3-digit NAICS code level, private bioscience would rank eighth in employment growth over the 18 year period. (This comparison uses Oregon QCEW data, and involves 79 industry sectors with employment greater than 500 jobs in both time periods.)

Life science research at Oregon universities and hospitals directly generated \$882.3 million in economic activity, including \$522.8 million in wages and 5,870 jobs. Including payroll taxes and benefits, total income for employees in life science research amounted to \$643.8 million. In addition, life science research institutions and employees directly generated \$45.0 million in state and local taxes.

- The average annual wage for life science research institutions was \$89,100 in 2020, or 51 percent greater than the statewide average wage for private sector employment.⁸
- Similar to private bioscience, life science research has experienced significant and steady growth. Since the first study for 2002, employment in life science research increased 123 percent (+3,240 jobs), total wages increased 259 percent (+\$377.3 million), and average annual wages increased 61 percent (+\$33,740).

Previous reports showed steady growth in life science research over time and significant growth recently. Life science research employment and wages increased 29 percent and 30 percent, respectively, between 2017 and 2020 as NIH funding for Oregon increased from \$310.9 million to \$424.0 million (or by \$113.1 million or 36 percent) over that same time period.

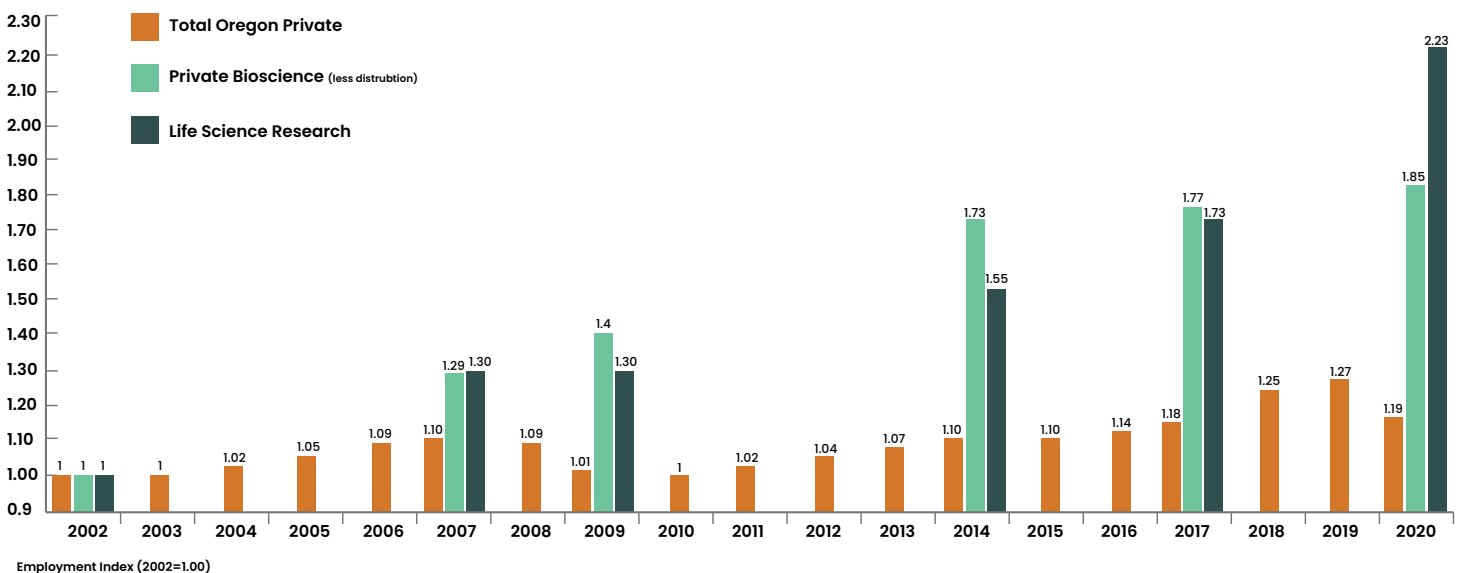
Oregon’s combined bioscience industry (private bioscience plus life science research) directly generated \$8.4 billion in economic activity, including \$2.0 billion in wages, 22,690 jobs, and \$4.4 billion in exports in 2020.⁹ Bioscience firms and their employees directly generated \$291.0 million in state and local taxes.

- Total bioscience employment increased by 8,509 jobs (+96 percent) between 2002 and 2020, with substantial employment growth in both private bioscience (+85 percent) and life science research (+123 percent).

As a young medical device company in the Willamette Valley, the thriving Oregon startup ecosystem has been critical in our ability to grow – Lazarus 3D has been supported through mentorship, training, networking and also promoting us as a woman-owned startup. The launch of Pre-Sure for surgical rehearsals on a personalized level was our huge milestone, and we’re grateful to be a part of fostering such a strong community for health tech here.

–Smriti Zaneveld, Ph.D., Founder and President, Lazarus 3D Inc., Albany, Oregon

Figure ES1
Bioscience Employment Changes, 2002–2020



⁸Average annual wages are down slightly since the previous study due to increased life science research activities at universities, which pay slightly less on average, and decreased life science research activities at hospitals, which pay slightly more on average.

⁹Bioscience export activity is largely attributed to private bioscience. However, much of life science research is funded by local and non-local private sources, and the federal government. In 2020, the National Institutes of Health funded \$424.0 million in medical research in Oregon. Similar to exports, non-local funding represents new dollars for the Oregon economy.

The direct economic activity associated with Oregon's bioscience industry will have secondary or "multiplier" spending effects for other sectors of Oregon's economy. Pinnacle estimates that the **total economic activity attributed to Oregon's bioscience industry amounts to \$15.7 billion in output (or sales), including \$5.0 billion in income and almost 66,000 jobs in 2020.** In addition, Oregon's bioscience industry is linked to economic activity that supports \$609.6 million in tax and fee revenues for state and local governments, as well as \$1.1 billion in federal government tax revenues.

Table ES2
Bioscience Total Impacts (\$ millions*)

Impact Measure	Direct	Indirect	Induced	Total
Jobs	22,690	21,331	21,912	65,932
Output*	\$8,442.9	\$3,884.1	\$3,372.5	\$15,699.5
Income*	\$2,447.8	\$1,460.7	\$1,122.8	\$5,031.3
Other Income*	\$1,499.1	\$604.0	\$732.5	\$2,835.6
State and Local Taxes/Fees*	\$291.0	\$147.2	\$171.4	\$609.6
Federal Taxes/Fees*	\$552.9	\$298.0	\$242.3	\$1,093.3

We are bringing our 'Factory of the Future' facility online in 2022 and looking to establish relationships with key educational and industry organizations to recruit talented employees across the organization where they can grow in a wide range of careers.

-Emily Leproust, Ph.D., CEO and Co-Founder, Twist Bioscience, Wilsonville, Oregon

As shown in Table ES3, the bioscience industry generates economic activity in every sector of the Oregon economy. Secondary impacts attributed to bioscience include:

- Indirect or supply-chain impacts of \$3.9 billion in economic activity, including \$1.5 billion in income and 21,331 jobs. Approximately 20 percent of indirect job impacts accrue to the professional and technical services sector, benefiting employees and firms in marketing, management, computer programming and design, accounting, legal, advertising, and architectural and engineering.
- Induced or consumption-driven impacts of \$3.4 billion in economic activity, including \$1.1 billion in income and 21,912 jobs. These relatively large induced impacts are attributed to the high-paying jobs in bioscience, as well as indirect impacts in Oregon that occur in high-wage sectors.

Table ES3
Bioscience Total Impacts by Major Industry Sector (\$ millions)

Major Industry Sector	Output	Income	Jobs	Jobs % of Total
Natural Resources	\$33.6	\$9.8	314	0.5%
Utilities	\$155.0	\$19.6	135	0.2%
Construction	\$74.8	\$24.0	348	0.5%
Manufacturing	\$3,727.8	\$670.4	7,447	11.3%
Trade	\$3,865.1	\$1,083.8	11,463	17.4%
Transportation	\$389.8	\$153.1	2,717	4.1%
Services	\$7,231.2	\$2,975.7	42,331	64.2%
Government	\$222.1	\$94.9	1,177	1.8%
Total All Industries	\$15,699.5	\$5,031.3	65,932	100.0%

From an economic impact perspective, the bioscience industry generates multiplier spending effects that benefit workers and business owners in other sectors of the Oregon economy. All else considered, the larger the multiplier, the greater the interdependence between an industry and the rest of the economy. According to the economic impact model of Oregon, the bioscience industry, in aggregate, has the following multipliers:

- An **employment multiplier of 3.1**, which suggests that every 10 jobs in the bioscience industry supports an additional 21 jobs in other sectors of the Oregon economy.¹⁰
- An **income multiplier of 2.2**, which shows that every \$1 million in income directly generated in the bioscience industry is linked to another \$1.2 million in income for workers and business owners in other industries in Oregon.

In 2020, of the 65,932 total jobs that are linked to Oregon’s bioscience industry, approximately 29,890 jobs were held by women and 14,430 jobs were held by minorities, including 1,830 jobs for Blacks, 6,100 jobs for Hispanics, 3,900 jobs for Asians, and 2,600 jobs for all other races.

- In 2020, the bioscience industry directly employed 10,450 women (46 percent of bioscience employment) and 4,800 minority workers (21 percent of bioscience employment).



Table ES4
Bioscience Job Impacts for Women and Minorities

Demographic Group	Direct	Indirect	Induced	Total	% of Total
Women	10,450	8,350	11,090	29,890	45.3%
All Minorities	4,770	4,590	5,070	14,430	21.9%
• Black	470	660	700	1,830	2.8%
• Hispanic	1,730	1,950	2,420	6,100	9.3%
• Asian	1,770	1,110	1,020	3,900	5.9%
• All Other Races	800	870	930	2,600	3.9%

In Oregon nearly 15 years ago, we opened our Hillsboro Technical Operations (HTO) facility, which plays a key role in the filling, packaging and distribution of Genentech and Roche medicines worldwide. In 2021, we opened a second facility in Hillsboro dedicated to pioneering individualized therapies as part of our commitment to the future of personalized healthcare. Combined, these facilities represent a \$650 million investment in the domestic production of medicines. We also expanded our presence to Portland, opening a new office in 2019 dedicated to patient access and adding more than 300 jobs to the local market – now we employ more than 900 here in Oregon. We are committed to advancing a more just and equitable healthcare system, and that includes ensuring diverse representation across all aspects of our business.

- Baoshu Zhao, Ph.D., VP and Site Lead, HTO
- Astou Gaye, VP and Site Lead, Hillsboro Individualized Therapies
- Mike McHugh, Executive Director and Site Lead, Portland Access Solutions Hillsboro and Portland, Oregon



¹⁰This is 65 percent greater than the weighted average IMPLAN job multiplier (1.87) across all industry sectors in Oregon. Weighted average job multipliers use industry employment to reflect the size or importance of each industry sector.



This study expands its geographic scope to include the bioscience industry in Clark County, Washington. The key findings of the bioscience industry in Clark County in 2020 include:

Private bioscience in Clark County consisted of 150 establishments that produced \$1.4 billion in output and employed 2,456 workers with wages of \$228.4 million. Adding in payroll taxes and other benefits, the total income for employees in private bioscience was over \$271.8 million. With \$1.2 billion in exports (85.7 percent of output), private bioscience brings new money to Clark County.

- Life science research at Washington State University’s Vancouver campus received \$3.1 million in funding in 2020.

Table ES5
Private Bioscience Direct Impacts in Clark County, 2020 (\$ millions*)

Economic Measure	Total Private Bioscience
Jobs	2,456
Output*	\$1,382.3
Income*	\$271.8
• Wages*	\$228.4
Other Income*	\$233.2
Exports*	\$1,184.5
Average Annual Wage	\$92,996
State and Local Taxes/Fees*	\$30.51
Federal Taxes/Fees*	\$63.8

The total economic impacts attributed to Clark County’s bioscience industry (including both private bioscience and life science research) consist of \$1.9 billion in output, including \$416.3 million in income and 5,410 jobs. In addition, the economic activity linked to Clark County’s bioscience industry generated \$56.8 million in tax and fee revenues for state and local taxing jurisdictions.

Table ES6
Private Bioscience Direct Impacts in Clark County, 2020 (\$ millions*)

Economic Measure	Direct	Indirect	Induced	Total
Jobs	2,478	1,861	1,071	5,410
Output*	\$1,385.4	\$320.2	\$164.2	\$1,869.7
Income*	\$274.3	\$91.5	\$50.5	\$416.3
Other Income*	\$233.6	\$54.3	\$36.6	\$324.6
State and Local Taxes/ Fees*	\$30.6	\$12.6	\$13.6	\$56.8
Federal Taxes/Fees*	\$94.9	\$33.3	\$25.8	\$154.1

We had great support in the early days as an anchor company in the OTRADI Bioscience Incubator when we launched in Portland. Now located in Clark County, we’ve continued to grow, most recently with our 2021 initial public offering. We find the community to be incredibly supportive of entrepreneurship and the technology we have and continue to develop. We’re expanding and recruiting effectively with all the Pacific Northwest has to offer. We are beginning to see other biotech companies expand to include greater Portland-area facilities. We at Absci hope to help draw even more development to the region.

–Sean McClain, Founder and CEO, Absci, Vancouver, Washington

Clark County’s bioscience industry has a multiplier spending effect as bioscience firms create additional local economic activity through supply-chain spending and the direct and indirect income creates additional consumption-driven spending.¹¹ For example, every \$1 million in bioscience output is linked to \$1.4 million in total economic activity, including \$300,500 in income, 3.9 jobs, and \$41,000 in state and local tax and fee revenues.

¹¹Given the different sizes of the Oregon and Clark County economies, multipliers should not be compared across study areas. All else the same, economic and fiscal impact multipliers will be smaller for economic study areas that are defined more narrowly. This is due to the fact that multipliers are inversely related to leakages or imports, i.e., the greater the propensity to import, the lower the multiplier.



MODELING APPROACH

As the name suggests—bio is a prefix meaning “life”—the bioscience industry consists of companies and institutions that apply science and technology to provide products and services related to human, plant and animal life. The bioscience industry consists of two main components: 1) private sector companies (“private bioscience”) engaged in manufacturing, research, testing and distribution, and 2) life science research activities at universities and hospitals (“life science research”).

In order to describe the data sources, analyses and the full range of impacts, this report measures the direct and total impacts of private bioscience and life science research separately. These measures are then added together to measure the direct and total impacts of the combined bioscience industry. In addition, this study expands its geographic scope to include the bioscience industry in Clark County, Washington.

The bioscience industry directly contributes to an economy by producing goods and services, hiring workers, and paying wages and taxes. The direct economic activity associated with bioscience operations will begin a multiplier spending effect that benefits workers and business owners in other sectors of the economy.

In order to produce goods and services, bioscience firms and life science research institutions will purchase a variety of goods and services such as intermediate goods and services used in production, as well as physical property or workspace, insurance, research supplies, legal services, transportation services, and utilities. This spending generates the first round of indirect impacts. Suppliers and vendors to firms in the bioscience industry will also have to purchase goods and services necessary to operate, and this spending leads to additional rounds of indirect impacts. Because they represent interactions among businesses, these indirect effects are often referred to as “supply-chain” impacts.

The direct and indirect economic activity generates income for workers and business owners. As incomes increase, so, too, does purchasing power. Households will use this income to pay their mortgage or rent, purchase groceries, take their children in for medical care, etc. These types of impacts are called induced impacts. These induced effects are often referred to as “consumption-driven” impacts.

Input-Output Modeling

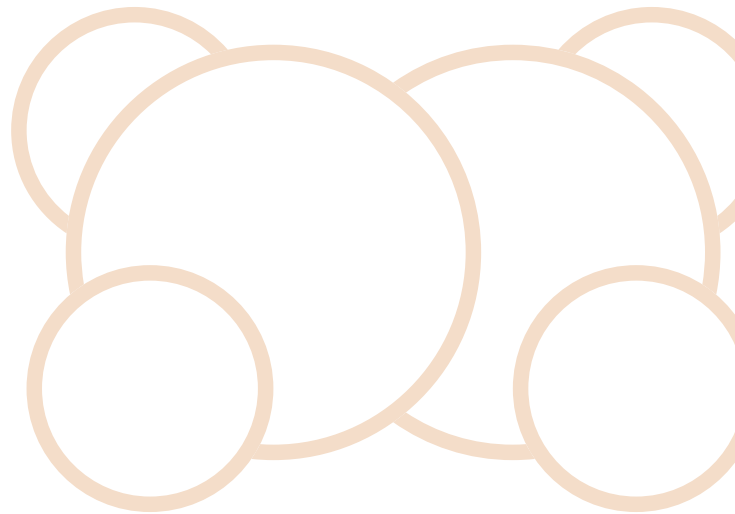
The economic modeling framework that best captures these direct, indirect, and induced effects is called input-output modeling. Input-output models provide an empirical representation of the economy and its inter-sectoral relationships, enabling the user to trace the effects (economic impacts) of a change in the demand for commodities (goods and services). Pinnacle used an input-output model of the Oregon economy constructed using the IMPLAN (for “Impact Analysis for PLANing”)¹² to trace the direct economic activity associated with the bioscience industry as it ripples through the Oregon economy.

IMPLAN is widely used and well respected and is generally regarded as the most reliable input-output modeling platform available. The United States Department of Agriculture (USDA) recognized the IMPLAN modeling framework as “one of the most credible regional impact models used for regional economic impact analysis” and, following a review by experts from seven USDA agencies, selected IMPLAN as its analysis framework for monitoring job creation associated with the American Recovery and Reinvestment Act (ARRA) of 2009.¹³ The IMPLAN model has been used in all six economic impact reports. This, combined with the same QCEW data sources, data processing techniques, and controls for changes to the industry definition, allows for the most consistent measure of impacts over time.

Economic Impact Measures

The following measures of economic activity are reported for both private bioscience and life science research:

- **Output** represents the total value of industry production. It is the broadest measure of economic activity and includes purchases of intermediate goods and services, as well as the total value added during production.
- **Total value added¹⁴** is the sum of personal income (wages and business income), other income, and indirect business taxes.¹⁵ Total value added is a component of output, and the two should not be added together.
 - **Personal income** (or “income”) consists of wages, benefits and payroll taxes. Wage data from the Oregon Employment Department and the Washington’s Employment Security Department’s Labor Market and Economic Analysis (LMEA) division includes tips, commissions, bonuses, vacation, and holiday pay, but does not include benefits and (covered) employers’ contributions to payroll taxes. These were estimated using IMPLAN. In this report, wages refer to OED or LMEA wages and income refers to wages plus IMPLAN payroll taxes and benefits.
 - **Other income** includes payments to individuals in the form of rents received on properties, royalties from contracts, dividends paid by corporations, and profits earned by corporations.
 - **Indirect business taxes** are taxes paid by businesses to local, state, and federal taxing jurisdiction.
- **Jobs** include both full- and part-time employment.
- **Exports** consist of the sales of goods and services outside of Oregon and Clark County. They include both domestic and international exports.
- **State and local taxes** include indirect business taxes (discussed above) as well as personal income taxes; social insurance taxes (employer and employee contributions); and various other taxes, fines and fees paid by businesses and households.
- **Federal taxes** include personal income taxes, social insurance taxes (employer and employee contributions), corporate income taxes, and business production taxes and imports.



¹²IMPLAN was developed by the Forest Service of the US Department of Agriculture in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management of the US Department of the Interior to assist federal agencies in their land and resource management planning. Pinnacle has applied the model to a variety of public and private sector projects. In fact, Pinnacle Economics was recognized by the American Council for an Energy-Efficient Economy (ACEEE) for our pioneering work using IMPLAN to measure the economic impacts of energy efficiency and renewable energy programs. See Bell, Barrett, and McNeerney, Verifying Energy Efficiency Job Creation: Current Practices and Recommendations, ACEEE, Report F1501, September 2015.

¹³See excerpts from an April 9, 2009 letter to MIG, Inc., from John Kort, Acting Administrator of the USDA Economic Research Service, on behalf of Secretary Vilsack, at www.implan.com.

¹⁴At the state level, total value added is also referred to as Gross State Product (GSP).

¹⁵According to the U.S. Bureau of Labor Statistics, “Total wages, for purposes of the quarterly UI reports submitted by employers in private industry in most States, include gross wages and salaries, bonuses, stock options, tips and other gratuities, and the value of meals and lodging, where supplied. In some of the States, employer contributions to certain deferred compensation plans, such as 401(k) plans, are included in total wages. Total wages, however, do not include employer contributions to Old-age, Survivors’, and Disability Insurance (OASDI); health insurance; unemployment insurance; workers’ compensation; and private pension and welfare funds.” See <http://www.bls.gov/opub/hom/pdf/homch5.pdf>



THE BIOSCIENCE INDUSTRY IN OREGON

This section measures the direct and total impacts for private bioscience and life science research separately, and then combines them to measure the direct and total impacts of the bioscience industry in Oregon.

Private Bioscience in Oregon

The direct impacts of private bioscience are measured using detailed, firm-level payroll and employment data (the Quarterly Census of Employment and Wages or QCEW)¹⁶ from the Oregon Employment Department for 2020 that is then augmented with output, value added, tax, and trade data from an economic impact model of Oregon developed using the IMPLAN economic impact modeling software. This information is then used to develop custom production functions for each private bioscience sector in the IMPLAN model to measure the total economic impacts of the industry in Oregon.

Defining Private Bioscience

In the United States, most industries are classified using the North American Industry Classification System (NAICS) coding framework. Industries have an official NAICS code, and data on the number of establishments, employees, payrolls, and other measures. Unfortunately, private bioscience does not conform neatly to the NAICS-based industry classification system. Indeed, private bioscience performs a variety of activities across a variety of industry sectors, each with their own NAICS code.

To measure the direct dimensions of the private bioscience industry, Pinnacle uses the industry-accepted definition reported in TEconomy/BIO's 2020 report (Table 1).¹⁷ Private bioscience consists of five major sectors and 24 industries, as reported at the six-digit NAICS code level. The private bioscience industry consists of:

- **Agricultural feed stocks and chemicals manufacturing.** This sector uses biotechnology and other life science technologies to process agricultural goods and feed stocks and produce chemicals. All subsectors within this sector are in manufacturing (NAICS 3112 and 3251-3).
- **Drugs and pharmaceutical manufacturing.** Falling entirely within the manufacturing sector (NAICS 3254), this bioscience sector manufactures medicinal and pharmaceutical products.
- **Medical devices and equipment manufacturing.** This bioscience sector includes six separate NAICS codes, with major groupings in electro-medical and control instruments manufacturing (NAICS 3345), and medical equipment and supplies manufacturing (NAICS 3391).
- **Research, testing, and medical laboratories.** This sector encompasses bioscience activities where human capital is a major input. Activities include biotechnology research and medical/health testing. This bioscience sector is a service sector (NAICS 5413, 5417, and 6215).
- **Bioscience-related distribution.** This sector consists of industries within the wholesale trade sector of the economy (NAICS 4234, 4242, and 4249). Firms in this sector use specialized techniques such as cold storage, advanced monitoring, and automated drug distribution systems to deliver bioscience-related goods such as pharmaceuticals, medical devices, and agricultural and chemical products. (This sector was added to the private bioscience definition in 2014. To provide the most reliable measure of industry changes between 2002 and 2020, the current study reports industry changes without bioscience-related distribution.)

¹⁶The QCEW Program is a cooperative program between states and the U.S. Department of Labor, Bureau of Labor Statistics (BLS). Payroll and employment data are acquired from quarterly tax reports submitted to the Oregon Employment Department by Oregon employers who are subject to the state's Unemployment Insurance (UI) laws. Although the data is highly regarded by government agencies, researchers, and others, the Oregon Employment Department advises, "Probably the most valuable use of the data printed in this publication is the ability they give the user to observe year-to-year trends of Oregon employment. However, there are certain restrictions that make strict year-to-year comparisons misleading or impossible. Technical changes in the unemployment insurance program, changes in the industrial classification system, or OED's ongoing review of assigned industry and location codes can sometimes cause the appearance of gains and losses in employment and wage tables. Such changes do not accurately reflect changes in the structure of Oregon's economy and as such may limit the legitimacy of year-to-year comparisons of data. This should be kept in mind when analyzing employment and payroll trends over many years." However, these changes do not significantly affect the industries included in this analysis.

¹⁷TEconomy/BIO, The Bioscience Economy: Propelling Life-Saving Treatments, Supporting State & Local Communities, 2020. The definition of private bioscience started with Battelle/BIO in their 2006, 2007, and 2010 studies. (See Battelle/BIO, Growing the Nation's Bioscience Sector: State Bioscience Initiatives, April 2006, Growing the Nation's Bioscience Sector: A Regional Perspective, January 2007, and State Bioscience Initiatives, May 2010.) This definition was then refined in Battelle/BIO's 2014 study. (See Battelle/BIO, State Bioscience Jobs, Investments, and Innovation, 2014.) These bioscience industry studies by Battelle/BIO were then updated by TEconomy/BIO in 2018 and 2020. Importantly, the principals at TEconomy include the authors from Battelle in the prior studies. (See, TEconomy/BIO, Investment, Innovation and Job Creation in a Growing U.S. Bioscience Industry, 2018.)

Table 1
Definition of Private Bioscience, 2020

Bioscience Sector / NAICS	NAICS Description
Agricultural Feed Stocks and Chemicals Manufacturing	
3112211	Wet corn milling
3112241	Soybean and other oilseed processing
325193	Ethyl alcohol manufacturing
325311	Nitrogenous organic fiber manufacturing
3253121	Phosphatic fertilizer manufacturing
325314	Fertilizer (mixing only) manufacturing
325320	Pesticide and other agricultural chemical manufacturing
Drugs and Pharmaceutical Manufacturing	
325411	Medicinal and botanical manufacturing
325412	Pharmaceutical preparation manufacturing
325413	In-vitro diagnostic substance manufacturing
325414	Other biological manufacturing
Medical Devices and Equipment Manufacturing	
334510	Electromedical apparatus manufacturing
334516	Analytical laboratory instrument manufacturing
334517	Irradiation apparatus manufacturing
339112	Surgical and medical instrument manufacturing
339113	Surgical appliance and supplies manufacturing
339114	Dental equipment and supplies manufacturing
Research, Testing and Medical Laboratories	
541380*	Testing laboratories
541714	Research and development in biotechnology
541715*	Research and development in the physical, engineering and life sciences
621511	Medical laboratories
Bioscience-related Distribution	
423450	Medical, dental, and hospital equipment and supplies wholesalers
424210*	Drugs and druggists' sundries merchant wholesalers
424910*	Farm supplies merchant wholesalers



Source: TEconomy/BIO, The Bioscience Economy: Propelling Life-Saving Treatments, Supporting State & Local Communities, 2020.
 Notes: 1. These industries did not exist in Oregon in 2020. 2. Asterisks (*) indicate industries that include firms that do not conduct bioscience-related activities. For these industries, Pinnacle researched each firm in the QCEW data using Dun & Bradstreet, Google, the Oregon Secretary of States' Corporate Division business search engine, and individual firm websites and annual reports to identify and include only those firms that actually conduct bioscience-related activities.

Private Bioscience Direct Impacts in Oregon in 2020

As shown in Table 2, in 2020, private bioscience in Oregon consisted of 1,480 firms that directly generated \$7.6 billion in output, including \$1.8 billion in income and 16,820 jobs. Income includes \$1.5 billion in wages (as reported in Oregon QCEW data) and \$316.4 million in benefits and payroll taxes (as estimated using IMPLAN). In addition, private bioscience is healthy and, as shown in the following section, with health comes growth. According to the IMPLAN model, in 2020, private bioscience generated \$1.4 billion in other income such as profits, royalties, dividends, and rents.

Table 2
Private Bioscience Direct Impacts in Oregon, by Sector, 2020 (\$ millions*)

Impact Measure	Agricultural Feed Stocks and Chemicals	Drugs and Pharma	Medical Devices and Equipment	Research, Testing and Medical Labs	Bioscience-related Distribution	Total Private Bioscience
# Establishments	42	73	147	559	659	1,480
Jobs	562	1,399	4,614	4,926	5,319	16,820
Output*	\$544.9	\$1,142.9	\$1,766.2	\$1,268.8	\$2,837.8	\$7,560.5
Gross State Product (a+b+c)*	\$109.2	\$292.3	\$685.9	\$765.9	\$1,540.8	\$3,394.0
a) Income*	\$56.5	\$114.6	\$443.6	\$465.2	\$724.1	\$1,804.0
• Wages*	\$43.3	\$88.0	\$341.5	\$396.0	\$618.8	\$1,487.6
b) Other Income*	\$44.7	\$139.4	\$216.1	\$284.5	\$732.9	\$1,417.7
c) Indirect Business Taxes*	\$8.0	\$38.2	\$26.1	\$16.2	\$83.9	\$172.3
Exports*	\$376.1	\$1,121.2	\$1,702.7	\$500.2	\$657.8	\$4,357.9
d) Domestic Exports*	\$309.2	\$992.6	\$1,407.8	\$176.8	\$312.3	\$3,198.7
e) Foreign Exports*	\$66.9	\$128.6	\$294.9	\$323.4	\$345.4	\$1,159.2
Exports % of Output	69.0%	98.1%	96.4%	39.4%	23.2%	57.6%

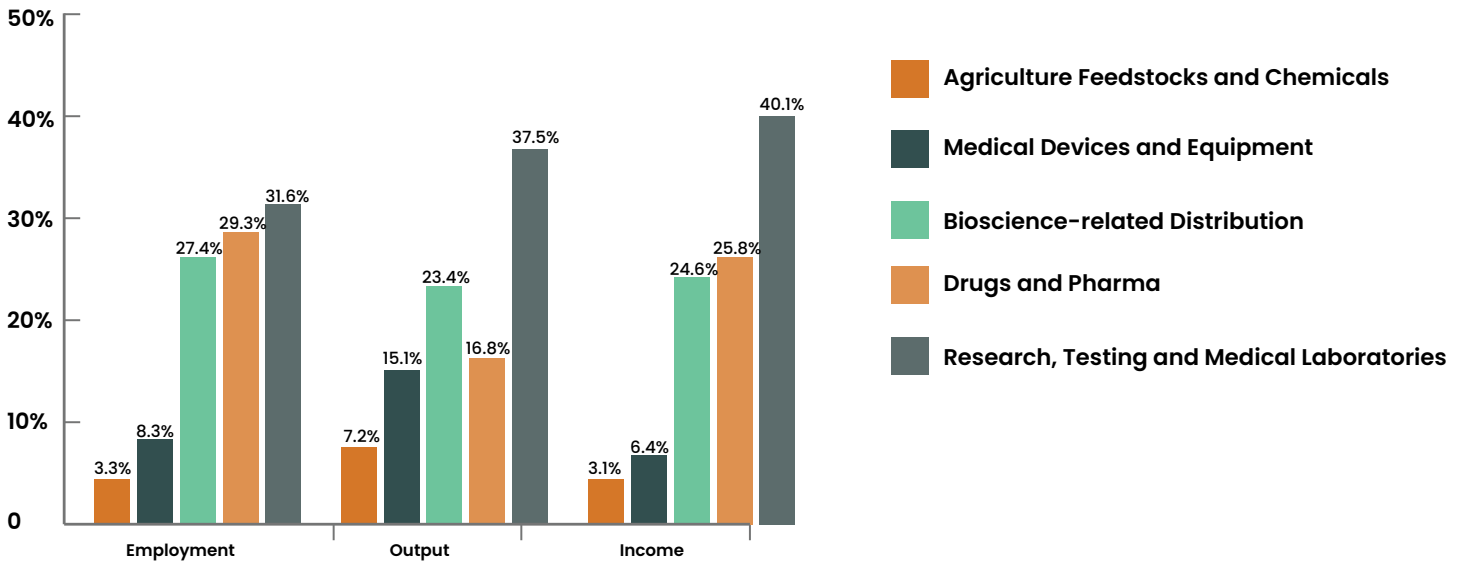
Sources: Pinnacle Economics using Oregon Employment Department QCEW data and an IMPLAN model of Oregon.

Private bioscience exported \$4.4 billion (57.6 percent of its total production) in 2020. Traded sectors are important to the state economy because they bring new money into the state rather than recycling existing dollars, where substitution effects tend to limit net, new economic activity. In addition, with about 70 percent of exports going to domestic markets and 30 percent of exports going to foreign markets, Oregon's private bioscience exports are diversified and minimize risk by insulating the Oregon economy from slow or contracting growth in one market.

Figure 1 provides additional context by showing the relative contribution of each major sector, across selected economic measures. (The findings for each major sector are summarized in the appendix of this report.)

Figure 1 provides additional context by showing the relative contribution of each major sector, across selected economic measures. (The findings for each major sector are summarized in the appendix of this report.)

Figure 1
Composition of Private Bioscience in Oregon, by Sector, 2020



Sources: Pinnacle Economics using Oregon Employment Department QCEW data and an IMPLAN model of Oregon.

All five sectors within private bioscience generate average annual wages that exceed the statewide average annual wage. **According to QCEW data, in 2020, the average annual wage in private bioscience was \$88,440 or 50 percent greater than the statewide average wage across all private employers (\$58,966).** Leading wage sectors in private bioscience include bioscience-related distribution (\$116,331 average annual wage); research, testing and medical laboratories (\$80,387); and medical devices and equipment manufacturing (\$74,007).

Table 3
Private Bioscience in Oregon Average Annual Wages, by Sector, 2020

Bioscience Sector	Average Annual Wage	% of Oregon Average Annual Wage
Agricultural Feedstocks and Chemicals	\$77,125	130.8%
Medical Devices and Equipment	\$74,007	125.5%
Bioscience-related Distribution	\$116,331	197.3%
Drugs and Pharmaceuticals	\$62,901	106.7%
Research, Testing and Medical Labs	\$80,387	136.3%
Private Bioscience All	\$88,440	150.0%

Sources: Pinnacle Economics using Oregon Employment Department QCEW data.
 Note: Oregon average annual wage based on all private sector employment.

Table 4 reports selected scientific, computer, engineering and manufacturing occupations in private bioscience in Oregon in 2020.

Table 4
Selected Occupations in Private Bioscience in Oregon, 2020

Occupation	Jobs	Income	Average Annual Income
SCIENTIFIC			
Medical Scientists, Except Epidemiologists	240	\$28,457,620	\$118,890
Clinical Laboratory Technologists and Technicians	170	\$5,652,420	\$32,660
Chemists	140	\$14,909,860	\$104,540
Natural Sciences Managers	130	\$25,765,400	\$198,230
Biological Technicians	120	\$6,734,100	\$54,810
Pharmacy Technicians	110	\$7,025,110	\$62,050
Biochemists and Biophysicists	100	\$12,325,140	\$128,540
Bioengineers and Biomedical Engineers	60	\$8,397,290	\$144,310
Biological Scientists, All Other	40	\$4,644,930	\$104,520
Life, Physical, and Social Science Technicians, All Other	40	\$3,100,310	\$70,080
COMPUTER AND ENGINEERING			
Software Developers and Software Quality Assurance Analysts	360	\$55,700,670	\$155,580
Industrial Engineers	190	\$24,724,630	\$128,880
Mechanical Engineers	140	\$16,759,290	\$119,380
Electrical Engineers	100	\$11,378,300	\$116,840
Computer and Information Systems Managers	90	\$21,098,810	\$231,060
Computer Systems Analysts	90	\$12,690,780	\$141,850
MANUFACTURING			
General and Operations Managers	340	\$83,255,630	\$245,560
Miscellaneous Assemblers and Fabricators	320	\$18,738,320	\$57,700
Electrical, Electronic and Electromechanical Assemblers	250	\$11,305,460	\$44,510
Laborers and Freight, Stock and Material Movers, Hand	360	\$22,393,140	\$62,820
Inspectors, Testers, Sorters, Samplers and Weighers	230	\$15,245,250	\$66,420
Packaging and Filling Machine Operators and Tenders	190	\$9,307,780	\$48,610
First-Line Supervisors of Production and Operating Workers	170	\$18,099,460	\$106,020
Chemical Equipment Operators and Tenders	90	\$6,392,620	\$72,540
Mixing and Blending Machine Setters, Operators and Tenders	80	\$4,726,260	\$57,660

Sources: Pinnacle Economics using Oregon Employment Department QCEW data and an IMPLAN model of Oregon.

Private bioscience in Oregon includes firms of all sizes.¹⁸ Small businesses with less than four employees accounted 67.8 percent of all private bioscience firms in Oregon in 2020. Firms with less than 100 employees account for 98.1 percent of all private bioscience firms in Oregon, and these firms employed 9,820 persons (58 percent of total private bioscience employment) and generated \$939.7 million in wages (63 percent) in 2020. Of course, private bioscience includes large employers. In 2020, private bioscience in Oregon include 28 firms with 100 or more employees, and these firms employed 7,000 persons (42 percent of total private bioscience employment) and generated \$547.8 million in wages (37 percent).

¹⁸ On average, private bioscience establishments in Oregon employed 11.4 persons in 2020.

Table 5
Direct Economic Impacts of Private Bioscience in Oregon, by Firm Size, 2020

Firm Size (# of employees)	# Firms	% of All Firms	Jobs	% of All Jobs	Wages (\$millions)	% of Total Wages
1-4	1,003	67.8%	1,352	8.0%	\$156.0	10.5%
5-9	162	10.9%	1,060	6.3%	\$115.9	7.8%
10-19	144	9.7%	1,948	11.6%	\$182.5	12.3%
20-99	143	9.7%	5,460	32.5%	\$485.4	32.6%
>100	28	1.9%	7,000	41.6%	\$547.8	36.8%
Total Private Bioscience	1,480	100.0%	16,820	100.0%	\$1,487.6	100.0%

Sources: Pinnacle Economics using Oregon Employment Department QCEW data.

Private bioscience exists in nearly every Oregon county and is well represented outside of the three-county Portland area. According to QCEW data, 535 private bioscience firms (36 percent) are known to be located outside of Portland, and they employed 6,640 persons (39 percent of total private bioscience employment) and generated \$481.1 million in wages (32 percent) in 2020.

Table 6
Direct Economic Impacts of Private Bioscience in Oregon, by Region and Congressional District, 2020

Region/ Congressional District	# Firms	Jobs	Wages (\$ Millions)
Portland (3-county)	717	8,946	\$806.6
Rest of Oregon	535	6,640	\$481.1
Statewide (county unknown)	228	1,234	\$199.8
Total	1,480	16,820	\$1,487.6
CD-1	282	5,531	\$506.5
CD-2	187	1,857	\$141.5
CD-3	311	3,462	\$280.7
CD-4	241	2,739	\$194.8
CD-5	231	1,997	\$164.2
Statewide (county unknown)	228	1,234	\$199.8
Total	1,480	16,820	\$1,487.6

To measure the job impacts by race and gender, Pinnacle augmented the IMPLAN economic impact model of Oregon with detailed demographic data for Oregon from the U.S. Equal Employment Opportunity Commission (EEOC). Table 7 breaks out the direct employment in Oregon's private bioscience industry sectors by gender and race. Private bioscience directly employed approximately 6,100 women and 3,900 minority persons in 2020.

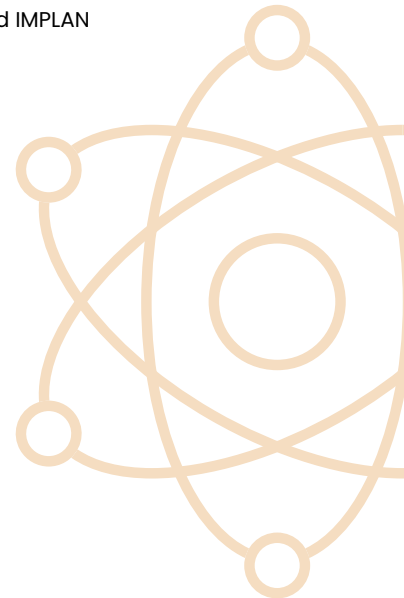
Sources: Pinnacle Economics using Oregon Employment Department QCEW data.

To measure the job impacts by race and gender, Pinnacle augmented the IMPLAN economic impact model of Oregon with detailed demographic data for Oregon from the EEOC.¹⁹ Table 7 breaks out the direct employment in Oregon’s private bioscience industry sectors by gender and race. Private bioscience directly employed approximately 6,100 women and 3,900 minority persons in 2020.

Table 7
Direct Employment of Private Bioscience in Oregon, by Sector and Demographic Group, 2020

Demographic Group	Agricultural Feed Stocks and Chemicals	Drugs and Pharma	Medical Devices and Equipment	Research, Testing and Medical Labs	Bioscience-related Distribution	Total Private Bioscience	% of Total Private Bioscience
Gender							
Men	401	999	3,225	2,108	3,994	10,728	63.8%
Women	161	400	1,389	2,818	1,325	6,092	36.2%
Total	562	1,399	4,614	4,926	5,319	16,820	100.0%
Race							
White	415	1,032	3,181	4,087	4,210	12,924	76.8%
Total All Minorities	147	367	1,433	839	1,109	3,896	23.2%
• Black	11	29	85	95	104	324	1.9%
• Hispanic	49	123	490	232	548	1,442	8.6%
• Asian	69	172	743	353	186	1,525	9.1%
• All Other Races	18	44	115	159	270	605	3.6%
Total	562	1,399	4,614	4,926	5,319	16,820	100.0%

Sources: Pinnacle Economics using Oregon Employment Department QCEW data and an EEOC-augmented IMPLAN model of Oregon.



¹⁹The EEOC requires employers to file reports on the composition of their work forces by sex and by race/ethnic category. Key among these reports are the EEO-1, which is collected annually from private employers with 100 or more employees or federal contractors with 50 or more employees, and EEO-4, which is collected biannually from state and local governments with more than 100 employees. Through these reports, EEOC provides employment patterns and participation rates, by industry sector at a three-digit NAICS code level, for every state. These participation rates were mapped to the 546 industry sectors in IMPLAN. Participation rates refer to the percent of total employment in a given industry that is occupied by a gender and/or racial group. For example, if an industry has 1,000 employees and a participation rate of 13.0 percent for Hispanic women, then Hispanic women account for 130 jobs in that industry in 2020. [Note: The employment impacts by gender and race are estimates. They have not been rounded in order to allow readers to fully trace all job impacts throughout this report.]

Private bioscience firms and their employees pay taxes and fees that support local, state and federal taxing jurisdictions. Table 8 reports the direct fiscal impacts attributed to private bioscience in Oregon in 2020. In total, private bioscience directly generated \$245.9 million in tax and fee revenues for state and local taxing jurisdictions in Oregon, and \$420.3 million in tax and fee revenues for the federal government in 2020.

Table 8

Direct Fiscal Impacts of Private Bioscience in Oregon, by Sector, 2020 (\$ millions)

Taxing Jurisdiction / Tax or Fee Category	Agricultural Feedstocks and Chemicals	Drugs and Pharma	Medical Devices and Equipment	Research, Testing and Medical Labs	Bioscience-related Distribution	Total Private Bioscience
State and Local						
Corporate Profits, Dividends	\$0.5	\$1.7	\$2.3	\$3.1	\$7.9	\$15.5
Business, Personal Property	\$4.4	\$21.5	\$14.4	\$9.0	\$46.1	\$95.5
Personal Income	\$1.9	\$3.9	\$14.5	\$16.2	\$24.5	\$61.0
Social Insurance	\$0.2	\$0.4	\$1.7	\$1.7	\$2.7	\$6.7
Other Taxes	\$2.5	\$12.0	\$8.2	\$5.3	\$25.9	\$53.9
Fines, Fees and Non-taxes	\$0.5	\$1.6	\$2.8	\$2.8	\$5.7	\$13.3
Total State and Local	\$9.9	\$41.2	\$44.0	\$38.0	\$112.8	\$245.9
Federal						
Corporate Profits, Dividends	\$1.0	\$3.6	\$4.8	\$6.3	\$16.2	\$31.8
Personal Income	\$3.9	\$7.8	\$29.2	\$32.5	\$49.2	\$122.5
Business Other Taxes, Fees	\$1.0	\$4.9	\$3.3	\$2.0	\$10.5	\$21.7
Social Insurance	\$7.7	\$15.5	\$59.6	\$63.5	\$98.1	\$244.3
Total Federal	\$13.5	\$31.7	\$96.9	\$104.2	\$173.9	\$420.3
Total All Taxes	\$23.5	\$72.9	\$140.8	\$142.2	\$286.8	\$666.2

Sources: Pinnacle Economics using Oregon Employment Department QCEW data and an IMPLAN model of Oregon.

As discussed previously, TEconomy/BIO's most recent definition of the bioscience industry is different than that used in the earliest four studies—four subsectors have been removed and one new major sector has been added. To accommodate this change and provide the most reliable measure of industry changes between 2002 and 2020, the current study adjusts (or removes) the four subsectors from the previous study results and adds the new major sector but reports industry changes without the new sector.

Table 9

Direct Economic Impacts of Private Bioscience in Oregon, by Sector, 2002–2020 (nominal dollars)

Impact Measure / Subsector	2002	2007	2009	2014	2017	2020	2002–2020	
							Change	% Change
Total Jobs								
Agricultural Feedstocks and Chemicals	265	345	404	503	581	562	+297	+111.9%
Drugs and Pharmaceuticals	752	799	911	1,018	1,121	1,399	+647	+86.1%
Medical Devices and Equipment	2,973	4,056	4,012	4,718	4,827	4,614	+1,641	+55.2%
Research, Testing and Medical Labs	2,242	2,869	3,383	4,526	4,496	4,926	+2,684	+119.7%
Bioscience-related Distribution	NA	NA	NA	3,024	3,578	5,319	NA	NA
Total Private Bioscience	6,232	8,069	8,710	13,789	14,603	16,820		
Total Private Bioscience Less Distribution				10,765	11,025	11,501	+5,269	+84.6%
Total Wages (\$ millions)								
Agricultural Feedstocks and Chemicals	\$10.1	\$16.7	\$21.1	\$30.2	\$36.8	\$43.3	+\$33.2	+328.9%
Drugs and Pharmaceuticals	\$26.8	\$30.4	\$38.1	\$67.3	\$69.7	\$88.0	+\$61.2	+228.7%
Medical Devices and Equipment	\$133.9	\$252.4	\$236.4	\$342.8	\$350.7	\$341.5	+\$207.6	+155.1%
Research, Testing and Medical Labs	\$104.7	\$160.3	\$210.0	\$301.9	\$307.9	\$396.0	+\$291.3	+278.3%
Bioscience-related Distribution	NA	NA	NA	\$228.0	\$263.7	\$618.8	NA	NA
Total Private Bioscience	\$275.4	\$459.9	\$505.6	\$970.3	\$1,028.8	\$1,487.6		
Total Private Bioscience Less Distribution				\$742.2	\$765.1	\$868.8	+\$593.4	+215.4%
Average Annual Wages								
Agricultural Feedstocks and Chemicals	\$38,099	\$48,383	\$52,284	\$60,043	\$63,303	\$77,125	+\$39,025	+102.4%
Drugs and Pharmaceuticals	\$35,610	\$38,094	\$41,824	\$66,171	\$62,147	\$62,901	+\$27,291	+76.6%
Medical Devices and Equipment	\$45,038	\$62,231	\$58,936	\$72,647	\$72,660	\$74,007	+\$28,969	+64.3%
Research, Testing and Medical Labs	\$46,691	\$55,886	\$62,060	\$66,715	\$68,486	\$80,387	+\$33,696	+72.2%
Bioscience-related Distribution	NA	NA	NA	\$75,403	\$73,702	\$116,331	NA	NA
Total Private Bioscience	\$44,200	\$56,993	\$58,052	\$70,367	\$70,451	\$88,440		
Total Private Bioscience Less Distribution				\$68,952	\$69,396	\$75,541	\$31,341	+70.9%

Source: Pinnacle calculations using Oregon Employment Department QCEW data.

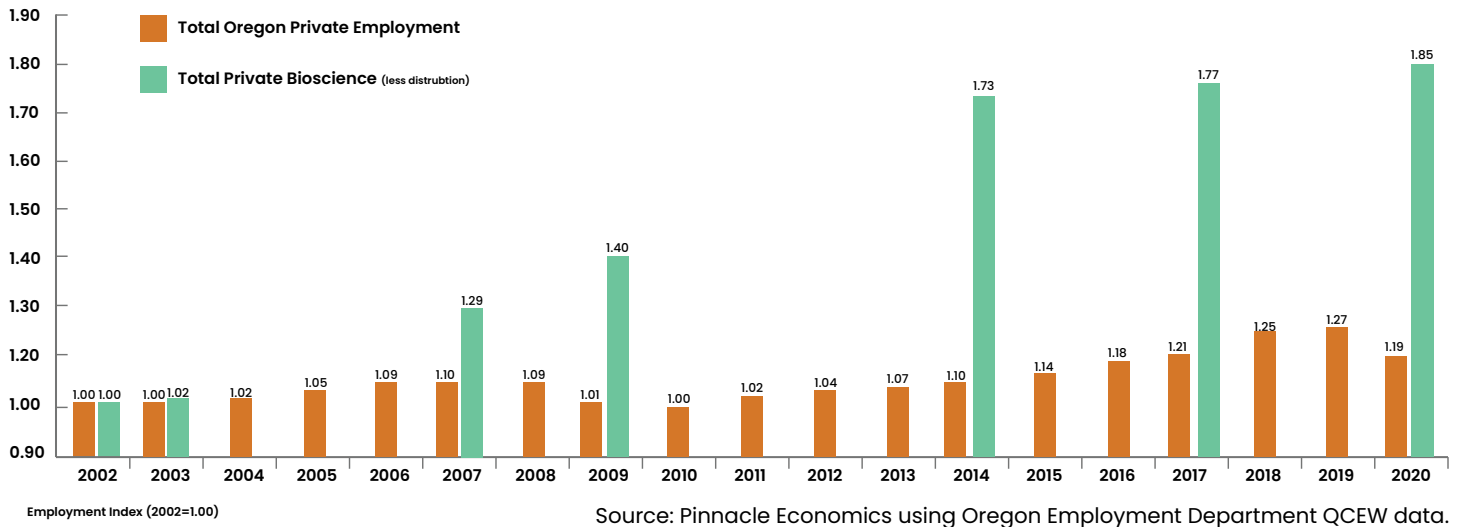
Note: In order to consistently compare the private bioscience industry over time, data for 2002 through 2009 has been adjusted to reflect changes in the definition of the industry.

Table 9 reports QCEW employment, wage and average annual wage data for Oregon's private bioscience industry from all six studies. In 2020, private bioscience in Oregon employed 16,820 persons, generated \$1.5 billion in wages, and had an average annual wage of \$88,440. These results include bioscience-related distribution, a sector added in Battelle/BIO's 2014 national study.

Even after controlling for definitional changes (see totals in blue font in Table 9), private bioscience in Oregon experienced significant growth over the 18-year period. Between 2002 and 2020, private bioscience employment increased 85 percent (+5,269 jobs), total industry wages increased 215 percent (+\$593.4 million), and average annual wages increased 71 percent (+\$31,341).

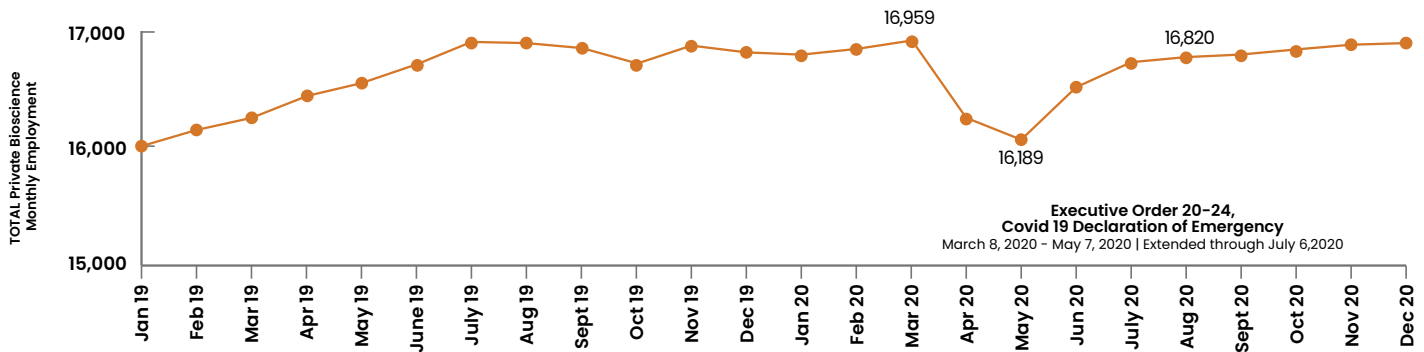
Figure 2 compares private bioscience employment with total private employment in Oregon since the first report for the Oregon Bio. (Employment levels are indexed to 2002). Between 2002 and 2020, private bioscience employment in Oregon increased 85 percent. This compares to a 19 percent increase in total private employment in Oregon over the same time period.

Figure 2
Private Bioscience and Total Private Employment in Oregon, 2002–2020 (Employment Index, 2002 = 1.00)



The impact of the coronavirus pandemic is evident in the decline in total private employment in Oregon in 2020. Total private employment in Oregon declined by 6.4 percent between 2019 and 2020. (See Figure 2.) Although this analysis reports annual jobs and wages for private bioscience, the QCEW data used in this analysis includes monthly private bioscience employment in Oregon for both 2019 and 2020. (See Figure 3.)

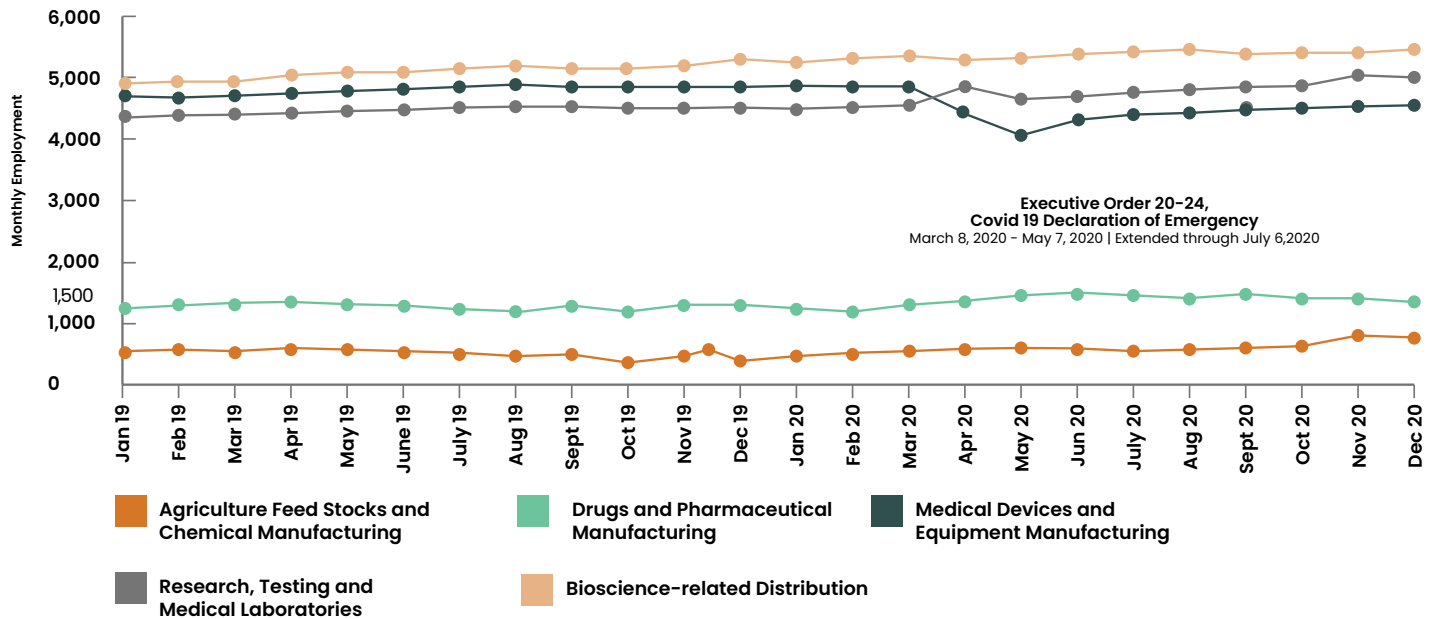
Figure 3
Private Bioscience and Total Private Employment in Oregon, 2002–2020 (Employment Index, 2002 = 1.00)



As is shown in Figure 3, bioscience employment was negatively affected by the coronavirus pandemic as private bioscience employment in Oregon fell by 770 jobs between March and May of 2020. However, this decline in employment appears to be largely transient and mostly constrained to one of the five private bioscience sectors. As shown in Figure 4, medical devices and equipment manufacturing experienced the largest and most notable decline in employment in the early stages of the coronavirus pandemic in Oregon, while the other four sectors appear to be largely unaffected.²⁰ (Per Figure 3, employment levels within private bioscience were largely restored within six months.)

²⁰ This review of monthly employment data is not intended to determine how the pandemic affected actual hiring plans of private bioscience businesses. That type of analysis would include additional efforts and (possibly) surveys that are beyond the scope of this analysis. The main points of the monthly employment analysis are twofold. First, to identify which year to use as our base year in the analysis. This involved assessing the tradeoffs between using older, 2019 data before the coronavirus vs. using more recent 2020 data that included possible negative hiring effects associated with the coronavirus. Given the transient and limited decline in employment in 2020, the project team elected to use newer, 2020 data. Second, monthly employment data was used to compare how the private bioscience industry fared during the early stages of the coronavirus relative to all private employers in Oregon. Is private bioscience more resilient to this type of economic shock? This is a complicated issue beyond the scope of this analysis. However, a comparison using monthly employment data suggests that private bioscience does exhibit some (more) resilience. In addition, researchers are finding that certain industries are less (or more) susceptible to the pandemic. For example, S&P Global found that health care technology, insurance, life sciences tools and services, semiconductors, and household products are the five least affected industries, based on the probability of default. See Vidovic, Luka, "Industries Most and Least Impacted by COVID-19: A Market-Implied Probability of Default Perspective," S&P Global Market Intelligence, October 19, 2021. <https://www.spglobal.com/marketintelligence/en/news-insights/blog/industries-most-and-least-impacted-by-covid-19-a-market-implied-probability-of-default-perspective>

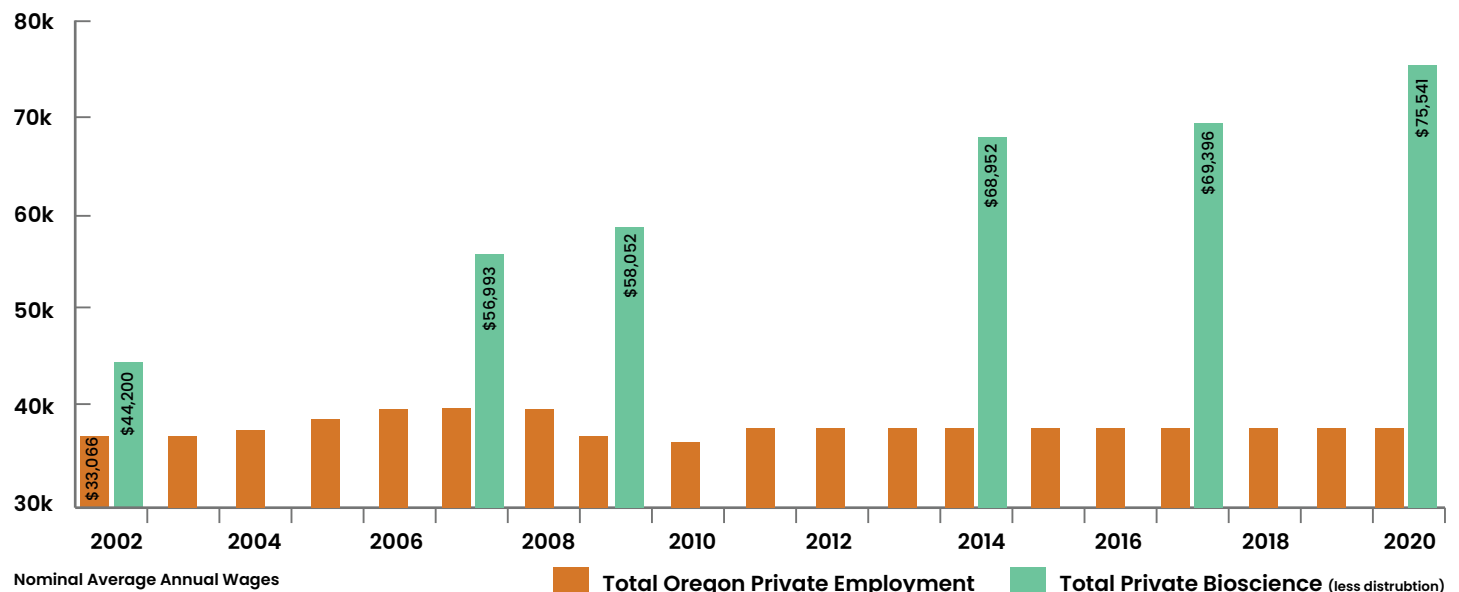
Figure 4
Private Bioscience Monthly Employment in Oregon, by Sector, 2020



Source: Pinnacle Economics using Oregon Employment Department QCEW data.

Figure 5 compares nominal average annual wages for private bioscience and all private employers in Oregon between 2002 and 2020. Average annual wages in private bioscience increased 71 percent since 2002. (Again, private bioscience average annual wages in 2020 do not include bioscience-related distribution, a new sector added to Battelle/BIO’s definition in 2014. Bioscience-related distribution, with average annual wage of \$116,300, is the highest wage sector of the five bioscience sectors. According to OED’s QCEW data, the average annual wage across all five private bioscience sectors is \$88,440 in 2020.)

Figure 5
Private Bioscience and Total Private Average Annual Wages in Oregon, 2002-2020 (nominal dollars)



Source: Pinnacle Economics using Oregon Employment Department QCEW data.

Figure 6 summarizes the key findings for each of the five sectors in private bioscience in Oregon. Statistics are provided for 2020, historical changes between 2002–2020, and recent changes between 2017–2020.

Figure 6
Summary of Key Findings for Private Bioscience Sectors

Medical Devices and Equipment

- \$1.8 billion in output, \$341.5 million in wages and 4,614 jobs in 2020 (all down slightly since 2017)
- With 1.7 billion in exports, largest exporter in private bioscience
- Average annual wage of \$74,00 in 2020 or 26 percent above average annual wage in Oregon
- Largest minority employer (1,433 jobs or 31% of sector employment)

Drug and Pharmaceuticals

- 1,399 jobs and \$88.0 million in wages in 2020
- \$1.1 billion in exports (rank #2) in 2020, with 98 percent of output for domestic or foreign markets
- Though wage growth has slowed recently, average annual wages are up \$27,291 or 77% (rank#2) since 2002

Agricultural Feedstocks and Chemicals

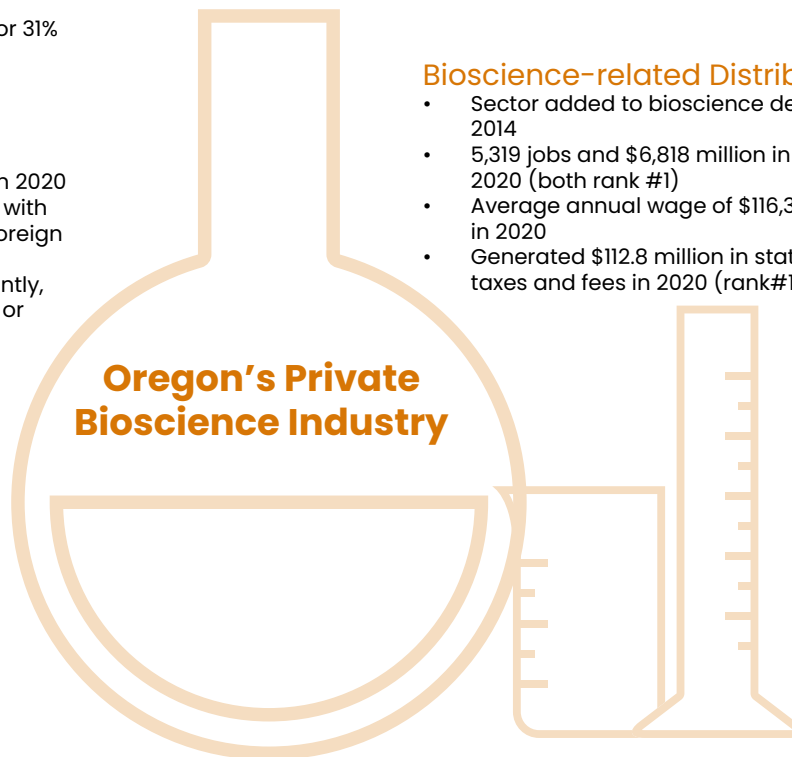
- Smallest sector
- Job growth has slowed recently
- Wage growth remains strong, #1 in average annual wage growth since 2002
- Exported 69% of output in 2020

Research, Testing and Medical Laboratories

- 559 firms (#2 rank)
- \$396.0 million in wages and 4,926 jobs (#2 rank in both) in 2020
- Largest employer of women (2,818 jobs or 57% of sector employment)

Bioscience-related Distribution

- Sector added to bioscience definition in 2014
- 5,319 jobs and \$6,818 million in wages in 2020 (both rank #1)
- Average annual wage of \$116,300 (rank #1) in 2020
- Generated \$112.8 million in state and local taxes and fees in 2020 (rank#1)



Source: Pinnacle calculations using Oregon Employment Department QCEW data and 2020 IMPLAN data for Oregon

Agricultural feed stocks and chemicals consists of 42 establishments and is the smallest bioscience sector in Oregon accounting for just 3.0 percent of total bioscience jobs and wages in 2020. In 2020, this sector generated \$544.9 million in output, employed 562 persons and paid \$43.3 million in wages. In addition, with \$376.1 million in exports, this sector accounts for 8.6 percent of private bioscience exports. The average annual wage was \$77,125 in 2020, or 31 percent above the average annual wage in Oregon, and increased 21.8 percent between 2017 and 2020 (rank #2). Job growth in this sector has stalled recently. Between 2017 and 2020, employment decreased slightly (-3.3 percent, last among all sectors).

Drugs and pharmaceuticals consists of 73 establishments that produced \$1.1 billion in output, and employed 1,399 persons with \$88.0 million in wages in 2020. This is the second largest export sector in private bioscience, with exports of \$1.1 billion (98 percent of total output) in 2020. The average annual wage was \$62,900 or 7 percent above the average wage in Oregon in 2020. This sector shows a 24.8 percent increase in jobs and a 26.3 percent increase in wages between 2017 and 2020. This translates into a 1.2 percent increase in average annual wages over the last three years (last among all five sectors).

Medical devices and equipment includes 147 establishments that generated \$1.8 billion in output, including \$341.5 million in wages and 4,614 jobs in 2020. With exports of \$1.7 billion, approximately 96 percent of this sector's output was exported. In 2020, the average annual wage for employees in medical devices and equipment was \$74,000 or 26 percent above the average annual wage in Oregon. Between 2017 and 2020, total employment decreased by 4.4 percent (-213 jobs) and total wages decreased

by 2.6 percent (-\$9.3 million). With 1,433 minority employees (31 percent of total employment) this is the largest minority employer in private bioscience.

Research, testing and medical laboratories includes activities carried out by 559 firms (38 percent of private bioscience), and with \$1.3 billion in output, \$396.0 million in wages and 4,926 jobs in 2020 is the second largest sector in private bioscience. The average annual wage in this sector was \$80,400 in 2020, or 36 percent above the average annual wage in Oregon. Between 2017 and 2020, wages increased by 2 percent and the average annual wage increased by \$11,900 or by 17 percent. Importantly, with 2,818 female employees (57 percent of sector employment), this sector is the largest employer of women in private bioscience.

Bioscience-related distribution is a new sector that was added to Battelle/BIO's definition of private bioscience in 2014. In 2020, bioscience-related distribution consists of 659 establishments that employed 5,319 persons (rank #1) and generated \$618.8 million in wages (rank #1). With an average annual wage of \$116,300 or nearly double the statewide average, bioscience-related distribution has the highest average annual wage of all bioscience sectors. In addition, in 2020, this sector generated \$112.8 million in tax and fee revenues for state and local governments (rank #1).

Private Bioscience Direct Impacts in Oregon in 2020

The previous section measured the direct dimensions of private bioscience in Oregon in 2020. This section provides measures of the total economic impacts or "contributions" of the private bioscience industry to Oregon's economy. The total economic impacts of an industry include the direct economic activity plus secondary or multiplier effects generated as a result of supply-chain (indirect impacts) and consumption-driven (induced impacts) spending that can be linked back to the industry. To measure this, Pinnacle:

1. Relied on the TEconomy/BIO definition of private bioscience;
2. Measured the direct impacts associated with private bioscience using Oregon Employment Department QCEW data; and
3. Fed these measures of direct economic activity into an input-output model of the Oregon economy for 2020 constructed using the IMPLAN modeling software to measure the economic linkages or multiplier spending effects for businesses and employees in other sectors of the state economy.

Table 10 reports the economic impacts of private bioscience in 2020, by type of impact. (Detailed economic and fiscal contributions for each sector of private bioscience are reported in the appendix to this report.)

Table 10
Economic Impacts of Private Bioscience in Oregon, by Type of Impact, 2020 (\$ millions*)

Impact Measure	Direct	Indirect	Induced	Total
Jobs	16,820	19,032	17,651	53,503
Output*	\$7,560.5	\$3,496.3	\$2,716.6	\$13,773.5
Gross State Product*	\$3,394.0	\$1,948.9	\$1,601.4	\$6,944.3
• Income*	\$1,804.0	\$1,331.1	\$904.5	\$4,039.6
• Other Income*	\$1,417.7	\$536.1	\$590.0	\$2,543.8
• Indirect Business Taxes*	\$172.3	\$81.8	\$106.9	\$361.0

Source: Pinnacle using Oregon Employment Department QCEW data and the IMPLAN model.

The **total** economic impacts of private bioscience in Oregon in 2020 amounted to \$13.8 billion in output, including \$6.9 billion in Gross State Product (GSP), \$4.0 billion in income, \$2.5 billion in other income, and over 53,500 jobs. The economic impacts, by type of impact, in 2020 include:

- Private bioscience **directly** contributed \$7.6 billion in output, including \$3.4 billion in value added or GSP, \$1.8 billion in income, \$1.4 billion in other income and 16,820 jobs. (These are the direct dimensions of the industry reported in Table 2.)
- The **indirect** impacts of private bioscience consist of \$3.5 billion in economic activity, including \$1.9 billion in income and 19,032 jobs. Approximately 21 percent of indirect job impacts benefit employees and firms in professional and technical services, such as marketing, management services, accounting, legal, advertising and architectural and engineering. These are high-paying sectors. Other major sectors benefiting from private bioscience supply-chain spending include administrative and waste services (18 percent of indirect jobs), management of companies (12 percent), transportation and warehousing (9 percent), real estate (9 percent), and finance and insurance (4 percent).
- The **induced** impacts of the private bioscience consist of \$2.7 billion in economic activity, including \$1.6 billion in income and 17,651 jobs. These relatively large induced impacts are attributed to the high-paying jobs in private bioscience (average annual wage of \$88,440 in 2020), as well as indirect impacts in Oregon that accrue to high-wage sectors. Sectors benefiting from consumption-driven spending associated with private bioscience include health care and social assistance (18 percent of induced job impacts), retail trade (15 percent), and food services (14 percent).

PROFESSIONAL SERVICES INDIRECT JOB IMPACTS

Marketing (585 jobs)

Management consulting (500 jobs)

Accounting, tax prep, bookkeeping (430 jobs)

Legal (450 jobs)

Advertising and public relations (410 jobs)

Architectural and engineering (340 jobs)

Environmental and other technical services (220 jobs)

Computer system design services (165 jobs)

The total economic impacts attributed to the five major sectors in private bioscience are shown in Table 11. The bioscience-related distribution sector generates the largest total impacts of all private bioscience sectors in Oregon. Depending on the measure, this sector accounts for between 40–43 percent of total private bioscience impacts. The medical devices and equipment manufacturing sector ranked second across all measures of total economic impacts.²¹

²¹ In the previous study, medical devices and equipment manufacturing had the largest total impacts on the Oregon economy, and bioscience-related distribution ranked third among the five bioscience sectors. In this study, bioscience-related distribution has the largest total impacts with medical devices and equipment manufacturing ranking second. This position shift between 2017 and 2020 is attributed to: 1) the slight decrease in direct employment, income, and output for medical devices and equipment manufacturing, 2) the increase in direct employment, income, and output for bioscience-related distribution, and 3) IMPLAN's new industry sector scheme that expands the wholesale trade sector from one industry in 2017 to nine industries in 2020. This last factor had the effect of significantly increasing the multiplier spending effects attributed to bioscience-related distribution. For example, IMPLAN's job multiplier for the wholesale trade sector in Oregon was 2.20 in 2017. The new job multipliers for detailed wholesale trade sectors that align with bioscience-related distribution are 2.70, 3.00, and 5.70 in 2020. Changes such as these suggest that caution must be exercised with time series analyses, especially with structural or definitional changes in industries (OED data) or the input-output modeling framework (IMPLAN).

As shown in Table 12, the total employment attributed to private bioscience consist of 53,503 jobs, including 22,372 jobs held by women (42 percent of total employment impacts) and 12,063 jobs held by minorities (23 percent).

Table 12
Private Bioscience Employment Impacts, by Type of Impact and Demographic Group, 2020

Demographic Group	Direct	Indirect	Induced	Total	Percent of Total
Gender					
Men	10,728	11,685	8,718	31,131	58.2%
Women	6,092	7,347	8,933	22,372	41.8%
Total	16,820	19,032	17,651	53,503	
Race					
White	12,924	14,949	13,567	41,440	77.5%
Total All Minorities	3,896	4,083	4,084	12,063	22.5%
• Black	324	591	561	1,476	2.8%
• Hispanic	1,442	1,719	1,951	5,112	9.6%
• Asian	1,525	1,002	823	3,349	6.3%
• All Other Races	605	772	749	2,126	4.0%
Total	16,820	19,032	17,651	53,503	100.0%

Source: Pinnacle Economics using Oregon Employment Department QCEW data and the IMPLAN model augmented with EEOC data for Oregon.

Note: Employment impacts by gender and race are estimates. They have not been rounded in order to allow readers to fully trace all job impacts reported in this analysis.

The sectors within private bioscience are concentrated in manufacturing (three sectors), wholesale trade (one), and services (one). From an economic impact perspective, the spending and income directly generated by private bioscience begins a multiplier spending effect that spreads economic activity to every major sector of the Oregon economy. Table 13 reports the total economic impacts associated with private bioscience in Oregon by aggregate industry sector and shows how the direct economic activity associated with private bioscience benefits other sectors of the Oregon economy.

Table 13
Total Economic Impacts of Private Bioscience by Aggregate Industry Sector, 2020

Aggregate Industry Sector	Output (\$ millions)	Income (\$ millions)	Jobs
Agriculture, forestry, fishing and hunting	\$20.6	\$7.9	236
Mining	\$8.0	\$0.5	34
Utilities	\$132.9	\$16.7	115
Construction	\$61.7	\$19.8	287
Manufacturing	\$3,697.8	\$665.2	7,356
Wholesale trade	\$3,492.4	\$925.5	7,393
Retail trade	\$261.7	\$116.5	3,177
Transportation and warehousing	\$360.2	\$142.1	2,518
Information services	\$308.8	\$75.0	759
Finance, insurance and real estate	\$1,511.1	\$227.2	4,439
Professional and technical services	\$1,500.8	\$602.4	7,251
Management of companies and enterprises	\$427.2	\$263.8	1,908
Administrative and waste services	\$364.2	\$186.7	4,211
Educational services	\$34.1	\$20.0	599
Health care and social assistance	\$907.1	\$446.3	5,869
Arts, entertainment and recreation	\$61.4	\$26.6	1,002
Accommodation and food services	\$210.9	\$85.2	2,950
Other services, except public administration	\$222.2	\$127.0	2,361
Government and unclassified sectors	\$190.2	\$85.0	1,040
	\$13,773.5	\$4,039.6	53,503

The economic activity linked to private bioscience generates tax and fee revenues for local, state and federal governments. These fiscal impacts are shown in Table 14, by type of impact. In total, private bioscience contributed approximately \$517.5 million in tax and fee revenues for state and local taxing jurisdictions in 2020. Approximately 47.5 percent (or \$245.9 million) of this total was directly generated by the private bioscience industry or its employees. In addition, the total economic activity attributed to private bioscience is linked to \$887.2 million in tax and fee revenues for the federal government in 2020.

Table 14
Fiscal Impacts of Private Bioscience, by Type of Impact, 2020 (\$ millions)

Taxing Jurisdiction / General Tax or Fee Category	Direct	Indirect	Induced	Total
State and Local				
Corporate Profits and Dividends	\$15.5	\$5.8	\$6.3	\$27.6
Business and Personal Property	\$95.5	\$45.2	\$58.7	\$199.4
Personal Income	\$61.0	\$44.1	\$30.0	\$135.1
Social Insurance	\$6.7	\$4.3	\$2.9	\$13.9
Other Taxes	\$53.9	\$25.7	\$33.0	\$112.6
Fines, Fees and Non-taxes	\$13.3	\$8.5	\$7.1	\$29.0
Total State and Local	\$245.9	\$133.5	\$138.1	\$517.5
Federal Government				
Corporate Profits and Dividends	\$31.8	\$11.9	\$13.0	\$56.7
Personal Income	\$122.5	\$88.6	\$60.3	\$271.4
Business Other Taxes and Fees	\$21.7	\$10.2	\$13.3	\$45.2
Social Insurance	\$244.3	\$161.1	\$108.5	\$513.9
Total Federal	\$420.3	\$271.7	\$195.2	\$887.2
Total All Taxes and Fees	\$666.2	\$405.3	\$333.2	\$1,404.7

Source: Pinnacle Economics using Oregon Employment Department QCEW data and the IMPLAN model.

All the impact measures described previously can be summarized across direct, indirect and/or induced impact categories using mathematical formulae to measure and explain what economists refer to as the “multiplier effect.” Multipliers are a shorthand way to better understand the linkages between an activity or policy and other sectors of the economy, i.e., the larger the multipliers, the greater the interdependence between private bioscience and the rest of the state economy. Table 15 reports the economic and fiscal impact multipliers associated with private bioscience in Oregon.

Table 15
Private Bioscience Impact Multipliers, 2020

Impact Measure	Multiplier
Output	1.8
Income	2.2
Jobs	3.1
State and Local Taxes	2.1

Source: Pinnacle Economics using Oregon Employment Department QCEW data and the IMPLAN model.

The economic activity linked to private bioscience generates tax and fee revenues for local, state and In 2020, the private bioscience industry has the following multiplier effects on the Oregon economy:

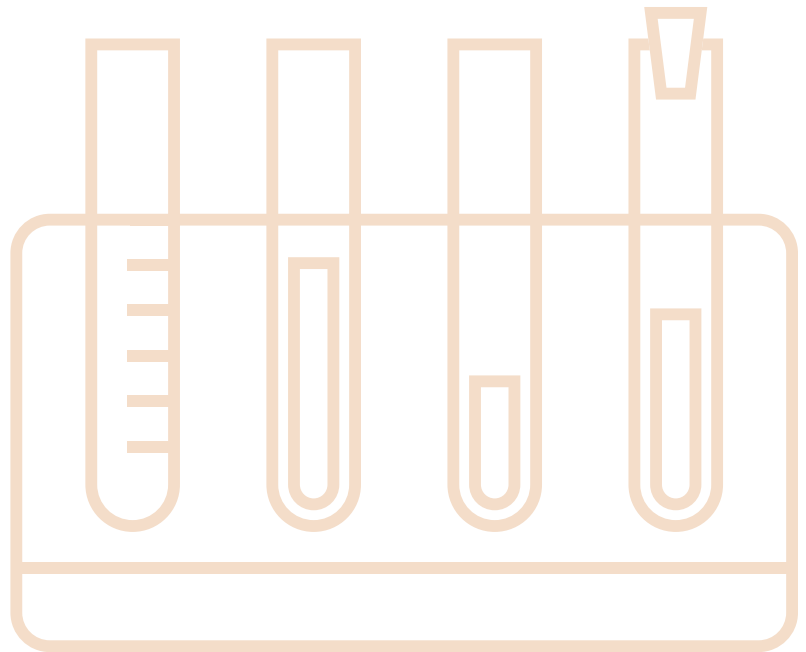
- **Income multiplier equals 2.2.** Thus, every \$1.0 million in income paid to private bioscience employees generates another \$1.1 million in income for workers in other sectors of the state economy.
- **Employment multiplier equals 3.1.** Thus, every ten direct private bioscience jobs are linked, on average, to another 21 jobs elsewhere in the state economy. This is approximately 65 percent greater than the weighted average IMPLAN employment multiplier (1.87) across all industries in Oregon.
- **State and local tax multiplier of 2.1.** Thus, every \$1.0 million in tax and fee revenues directly generated by private bioscience companies or their employees is linked, on average, to another \$1.1 million in tax and fee revenues for state and local governments.

The linkages between private bioscience and the rest of the Oregon economy can be assessed or quantified by calculating how much economic activity is supported by \$1.0 million in private bioscience output (or spending). This measure is particularly useful for private bioscience stakeholders as they explain the contributions of the industry to government officials, industry members, and other audiences. As shown in Table 16, on average, \$1 million in output from private bioscience supports a total of \$1.8 million in statewide economic activity, including \$534,300 in income, 7.1 jobs, and \$68,500 in tax and fee revenues for state and local governments.

Table 16
Total Economic and Fiscal Impacts Per \$1 Million in Private Bioscience Output, 2020

Impact Measure	Per \$1 Million in Direct Output
Output	\$1,822,000
Income	\$534,300
Jobs	7.1
State and Local Taxes	\$68,500

Source: Pinnacle Economics using Oregon Employment Department QCEW data and the IMPLAN model.



Life Science Research in Oregon

This section describes the direct and total impacts of life science research in Oregon in 2020. The direct impacts of life science research institutions were measured using data gathered by Oregon Bio and, in some cases, from employment and payroll data for life science research institutions observed in the QCEW data. This data is then augmented with output, value added, tax, and trade data from an economic impact model of Oregon developed using the IMPLAN economic impact modeling software. All of this information is then used to develop custom production functions for life science research in Oregon to measure the total economic impacts.

Defining Life Science Research

In addition to private bioscience, bioscience or life science research activities occur at universities and hospitals in Oregon. According to Battelle/BIO:

“A fifth (now sixth) subsector of the biosciences might include research hospitals, academic health centers, and other research-driven medical institutions. Many U.S. hospitals partner with universities and other research centers to further advances in the biosciences with a particular focus on healthcare applications.”²²

Life science research institutions include Oregon Health & Science University (OHSU), Oregon State University, University of Oregon, Portland State University, Pacific University, Reed College, the National University of Natural Medicine (NUNM), the Center for Health Research at Kaiser Permanente, Providence Health & Services Research Centers, and Legacy Research Institute.

Funding, employment, and payroll data for life science research institutions has historically not been available by NAICS codes. This year, however, QCEW data contained employment and payroll data for Legacy and Kaiser. For the others, Oregon Bio worked closely with universities and hospitals to obtain this data for life science research in 2020. This is difficult information for life science research institutions to collect. As such, not all requested data points were obtained. However, in this sixth study, Pinnacle used information from previous studies to estimate some activity levels for some research institutions.²³

Direct Impacts of Life Science Research in Oregon in 2020

The direct impacts of life science research in Oregon in 2020 are reported in Table 17. In 2020, life science research directly generated \$882.3 million in economic activity, including \$522.8 million in wages and 5,870 jobs. Based on payroll data supplied by life science research institutions and OED, the average annual wage was \$89,100 in 2020, or 51 percent greater than the statewide average wage for all private sector employment.

Source: Pinnacle Economics using Oregon Employment Department QCEW data and the IMPLAN model.

Table 17
Direct Economic Impacts of Life Science Research, 2020 (\$ millions*)

Impact Measure	Life Science Research
Jobs	5,870
Output*	\$882.3
Gross State Product (a+b+c)*	\$744.6
a) Income*	\$643.8
• Wages*	\$522.8
b) Other Income*	\$81.4
c) Indirect Business Taxes*	\$19.5
Exports*	\$83.7
Exports % of Output	9.5%

²²Battelle/BIO, Growing the Nation's Bioscience Sector: A Regional Perspective, January 2007. p. 3. Battelle also describes the inherent difficulty of measuring this segment of the bioscience industry. “From a data perspective, however, under the current NAICS system it is not possible to isolate the relevant bioscience research-oriented establishments within the larger hospitals sector. Thus, while Battelle acknowledges the critical role these research institutions play in advancing life sciences research and the bioscience industry, we are unable to accurately isolate this activity in the current federal data framework.”

²³For example, OHSU did not provide employment estimates. However, for institutions that did, the ratio of direct employment to funding was remarkably close across institutions and averaged 7.3 jobs per million dollars in funding. For 2020, this ratio was applied to OHSU's total research funding estimate to estimate their number of direct hires. This approach was developed in close cooperation with staff at OHSU as part of the 2014 study.

Table 18 reports life science research direct jobs by gender and race. In 2020, life science research in Oregon directly employed 4,355 women and 883 minorities. Life science research is a significant job generator for women. In 2020, women held just over 74 percent of the direct jobs in life science research.

Table 18
Direct Life Science Research Employment by Demographic Group, 2020

Demographic Group	Jobs	% of Life Science Jobs
Gender		
Men	1,514	25.8%
Women	4,355	74.2%
Total	5,870	100.0%
Race		
White	4,987	85.0%
Black	146	2.5%
Hispanic	290	4.9%
Asian	250	4.3%
All Other Races	196	3.3%
• Total All Minorities	883	15.0%
Total	5,870	100.0%

Sources: Pinnacle Economics life science research employment data.

Life science research institutions and their employees pay taxes and fees that support local, state and federal taxing jurisdictions. Table 19 reports the fiscal impacts directly attributable to life science research in Oregon in 2020. In total, life science research directly generated \$45.0 million in tax and fee revenues for state and local taxing jurisdictions, and \$132.6 million in tax and fee revenues for the federal government.

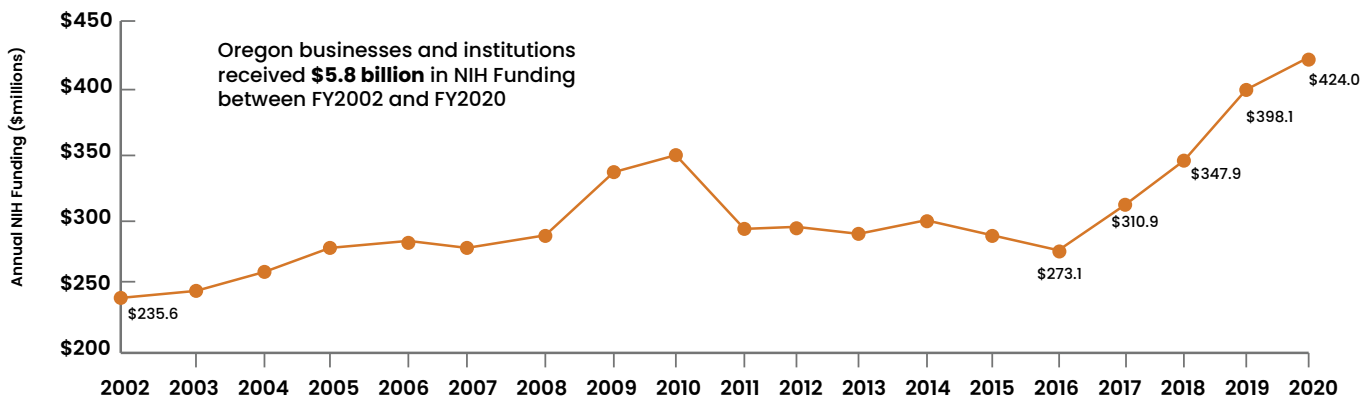
Table 19
Direct Fiscal Measures of Life Science Research, 2020 (\$ millions)

Taxing Jurisdiction/ / General Tax or Fee Category	Life Science Research
State and Local	
Corporate Profits and Dividends	\$0.9
Business and Personal Property	\$10.9
Personal Income	\$21.0
Social Insurance	\$2.4
Other Taxes	\$6.4
Fines, Fees and Non-taxes	\$3.5
Total State and Local	\$45.0
Federal	
Corporate Profits and Dividends	\$1.8
Personal Income	\$42.1
Business Other Taxes and Fees	\$2.4
Social Insurance	\$86.3
Total Federal	\$132.6
Total All Taxes	\$177.7

Sources: Pinnacle Economics using life science research data as inputs into an IMPLAN model of Oregon.

Life science research in Oregon is funded by a mix of revenues, private grants, state and local awards, and federal awards. By far the largest funding source of life science research in this state is awards (grants) from the U.S. Department of Health & Human Services’ National Institutes of Health (“NIH”). Between 2002 and 2020, life science researchers in Oregon received \$5.8 billion in NIH funding (on average \$304.9 million per year). All else the same, this funding would likely not accrue to the state but for the presence of life science research in Oregon. In this way, federal funding that supports life science research is similar to private bioscience’s exports of goods and services in that it brings “new” money to the state. NIH funding increased to its highest level (\$424.0 million) in 2020. Over the last four years, NIH funding to Oregon increased by \$155.1 million or by 55.2 percent.

Figure 7
NIH Awards to Oregon, 2002–2020
 (nominal dollars)



Source: U.S. Department of Health & Human Services, NIH Research Portfolio Online Reporting Tool, <https://report.nih.gov/about.aspx>

RECENT CHANGES 2017–2020

Life Science Research		All Private Industries in Oregon	
Employment	+28.9%	Employment	-1.7%
Wages	+29.9%	Wages	+14.9%
Avg. Annual Wages	+0.8%	Avg. Annual Wages	+16.8%

• Nominal wages

NIH funding is increasing. Life science research in Oregon is healthy and growing. Table 20 reports life science research direct jobs, wages and average annual wages from all six studies. The results are impressive across all economic measures. Between 2002 and 2020, employment increased by 3,239 jobs (+123 percent), total wages increased by \$377.3 million (+259 percent), and average annual wages increased by \$33,740 (+61 percent).

Table 20
Direct Economic Measures of Life Science Research, 2002–2020 (nominal dollars)

Economic Measure	2002	2007	2009	2014	2017	2020	Change 2002–2020	% Change 2002–2020
Jobs	2,630	3,418	3,406	4,085	4,554	5,870	+3,239	+123.1%
Total Wages (\$ millions)	\$145.6	\$237.8	\$273.9	\$355.7	\$402.4	\$522.8	+\$377.3	+259.2%
Average Annual Wages (\$)	\$55,335	\$69,567	\$80,400	\$87,085	\$88,357	\$89,074	+\$33,740	+61.0%

Sources: Pinnacle Economics using life science research data.

Figure 8 compares life science research employment with total private employment in Oregon between 2002 and 2020. Over this 18-year period, life science employment increased 123 percent compared to 19 percent for all private employers in Oregon.

Figure 8
Life Science Research and Total Private Employment in Oregon, 2002–2020
 (Employment Index, 2002 = 1.00)

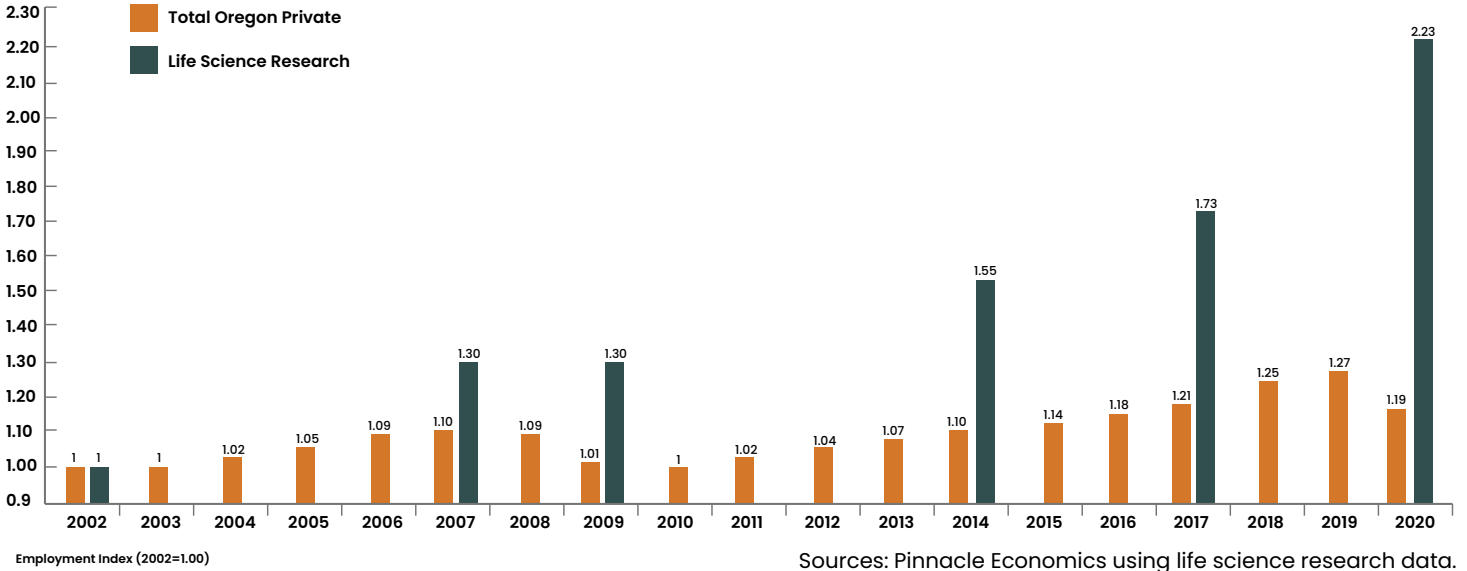
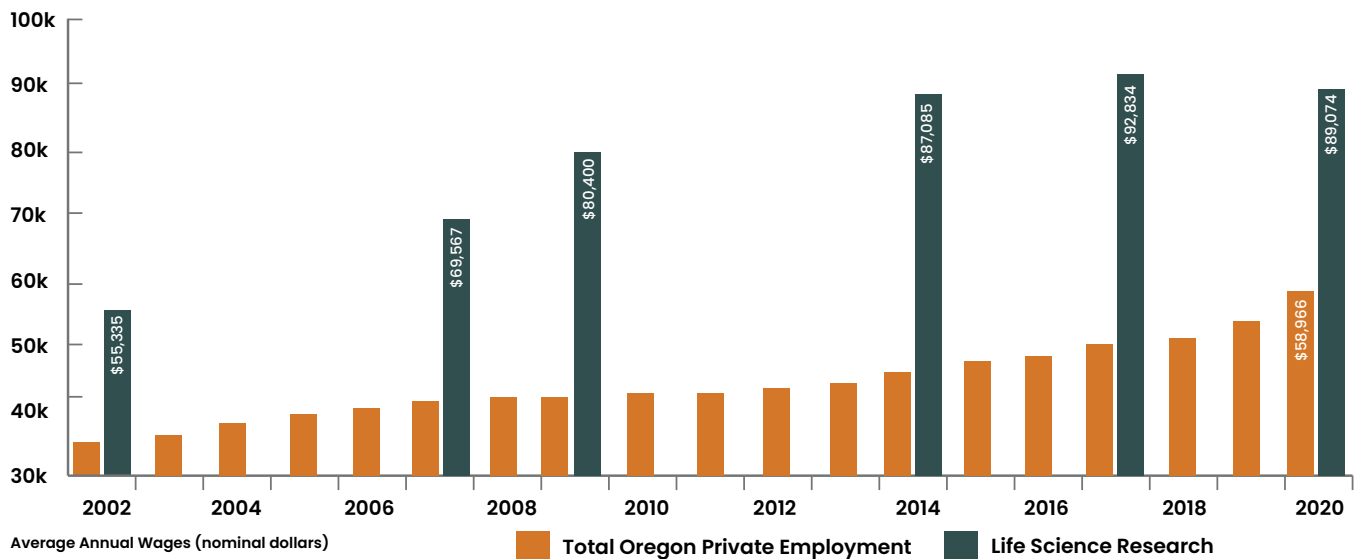


Figure 9 compares nominal average annual wages for life science research and all private employers in Oregon between 2002 and 2020. Average annual wages in life science research are greater and have increased faster than average annual wages for all private employers. Between 2002 and 2020, average annual wages in life science research increased 61 percent. Average annual wages for all private employers in Oregon increased 53 percent over this same period. Figure 9 also shows a slight decline in average annual wages for life science research between 2017 and 2020. This is due to the changing mix of research activities, i.e., increased life science research activities at universities (which pay slightly less on average) and decreased life science research activities at hospitals (which pay slightly more on average).

Figure 9
Life Science Research and Total Private Average Annual Wages in Oregon, 2002–2020
 (nominal dollars)



Sources: Pinnacle Economics using life science research data.

Total Impacts of Life Science Research in Oregon in 2020

This section presents the total impacts (or contributions) of life science research in Oregon in 2020. The **total** economic impacts of life science research in Oregon amounted to \$1.9 billion in output, including \$1.3 billion in value added production (GSP), \$991.8 million in income, \$291.8 million in other income, and 12,429 jobs in 2020. Life science research is linked to the following types of impacts in Oregon in 2020:

- **Direct** impacts of \$882.3 million in economic activity, including \$643.8 million in income and 5,870 jobs (this is the same information as reported in Table 17);
- **Indirect** or supply-chain impacts of \$387.8 million in sales, \$129.6 million in income and 2,299 jobs; and
- **Induced** or consumption-driven impacts of \$655.9 million in sales, \$218.3 million in income, and 4,261 jobs.

Table 21

Economic Impacts of Life Science Research, by Type of Impact, 2020 (\$ millions*)

Impact Measure	Direct	Indirect	Induced	Total
Jobs	5,870	2,299	4,261	12,429
Output*	\$882.3	\$387.8	\$655.9	\$1,926.0
Gross State Product*	\$744.6	\$206.1	\$386.7	\$1,337.4
• Income*	\$643.8	\$129.6	\$218.3	\$991.8
• Other Income*	\$81.4	\$68.0	\$142.5	\$291.8
• Indirect Business Taxes*	\$19.5	\$8.5	\$25.8	\$53.8

Source: Pinnacle Economics using life science research data and the IMPLAN model.

Table 22 reports the direct, indirect and induced jobs generated by life science research by demographic group. In 2020, life science research directly employed an estimated 4,355 women and, through multiplier spending effects, generated employment for over 7,500 women in Oregon. Similarly, life science research directly employed an estimated 880 minority workers and, through multiplier spending effects, generated employment for 2,380 minority workers in Oregon.

Table 22

Life Science Research Employment Impacts by Demographic Group and Type of Impact, 2020

Demographic Group	Direct	Indirect	Induced	Total	% of Total Jobs
Gender					
Men	1,514	1,299	2,105	4,918	39.6%
Women	4,355	1,000	2,156	7,511	60.4%
Total	5,870	2,299	4,261	12,429	100.0%
Race					
White	4,987	1,789	3,275	10,050	80.9%
Total All Minorities	883	511	986	2,379	19.1%
• Black	146	73	135	354	2.9%
• Hispanic	290	234	471	995	8.0%
• Asian	250	107	199	556	4.5%
• All Other Races	196	97	181	474	3.8%
Total	5,870	2,299	4,261	12,429	100.0%

Sources: Pinnacle Economics Gender and Race Employment Calculator, life science research employment data, and IMPLAN.

Life science research activities are concentrated at universities and hospitals. However, the spending and income directly generated by life science research generates additional economic activity in other sectors of the Oregon economy. Table 23 reports the total economic impacts associated with life science research in Oregon by aggregate industry sector and shows how the direct economic activity associated with life science research benefits other sectors of the Oregon economy.

Table 23
Total Economic Impacts of Life Science Research by Aggregate Industry Sector, 2020

Aggregate Industry Sector	Output (\$ millions)	Income (\$ millions)	Jobs
Agriculture, forestry, fishing and hunting	\$4.0	\$1.3	40
Mining	\$0.9	\$0.1	4
Utilities	\$22.1	\$2.9	20
Construction	\$13.1	\$4.2	61
Manufacturing	\$29.9	\$5.2	91
Wholesale trade	\$51.2	\$15.1	162
Retail trade	\$59.7	\$26.7	731
Transportation and warehousing	\$29.6	\$11.0	199
Information services	\$43.2	\$10.5	108
Finance, insurance and real estate	\$345.9	\$50.0	1,016
Professional and technical services	\$79.4	\$39.9	558
Management of companies and enterprises	\$21.7	\$13.4	97
Administrative and waste services	\$64.0	\$31.1	709
Educational services	\$222.0	\$151.4	1,520
Health care and social assistance	\$788.6	\$562.3	5,458
Arts, entertainment and recreation	\$12.9	\$5.4	203
Accommodation and food services	\$54.5	\$22.2	764
Other services, except public administration	\$51.3	\$29.2	550
Government and unclassified sectors	\$31.9	\$10.0	137
Total All Sectors	\$1,926.0	\$991.8	12,429

Source: Pinnacle Economics using life science research data and the IMPLAN model.

The economic activity linked to life science research generates tax and fee revenues for local, state and federal governments. These fiscal impacts are shown in Table 24, by type of impact. In total, life science research contributed \$92.0 million in tax and fee revenues for state and local taxing jurisdictions in 2020. In addition, the economic activity associated with life science research generated \$206.1 million in tax and fee revenues for the federal government in 2020.

Table 24
Fiscal Impacts of Life Science Research, by Type of Impact, 2020
 (\$ millions)

Taxing Jurisdiction / General Tax or Fee Category	Direct	Indirect	Induced	Total
State and Local				
Corporate Profits and Dividends	\$0.9	\$0.7	\$1.5	\$3.1
Business and Personal Property	\$10.9	\$4.7	\$14.2	\$29.8
Personal Income	\$21.0	\$4.3	\$7.2	\$32.5
Social Insurance	\$2.4	\$0.4	\$0.7	\$3.5
Other Taxes	\$6.4	\$2.7	\$8.0	\$17.0
Fines, Fees and Non-taxes	\$3.5	\$0.8	\$1.7	\$6.1
Total State and Local	\$45.0	\$13.7	\$33.4	\$92.0
Federal Government				
Corporate Profits and Dividends	\$1.8	\$1.5	\$3.1	\$6.4
Personal Income	\$42.1	\$8.7	\$14.6	\$65.4
Other Business	\$2.4	\$1.1	\$3.2	\$6.7
Social Insurance	\$86.3	\$15.1	\$26.2	\$127.6
Total Federal	\$132.6	\$26.3	\$47.1	\$206.1
Total All Taxes and Fees	\$177.7	\$40.0	\$80.5	\$298.1

Source: Pinnacle Economics using life science research data and the IMPLAN model.

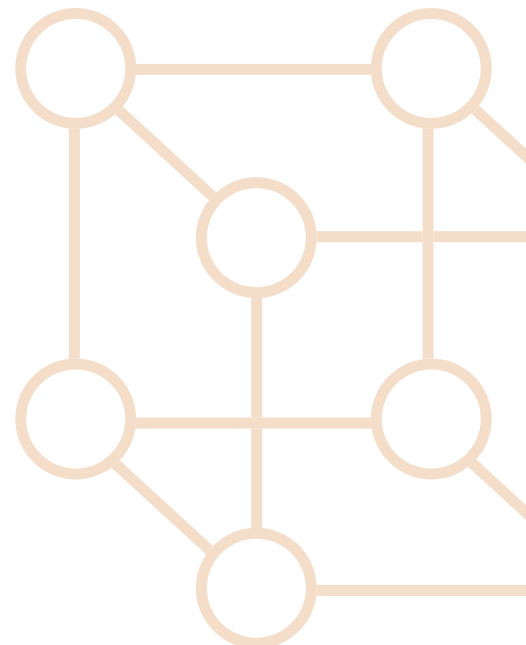


Table 25 reports the economic and fiscal impact multipliers associated with life science research in Oregon in 2020. According to data provide by life science research institutions and the IMPLAN model of the Oregon economy, life science research has the following multiplier effects:

- **Income multiplier equals 1.5.** Thus, every \$1.0 million in income paid to life science research employees generates another \$500,000 in income for workers in other sectors of the state economy.
- **Employment multiplier equals 2.1.** Thus, every ten direct life science research jobs are linked, on average, to another 11 jobs elsewhere in the state economy.

Table 25
Life Science Impact Multipliers, 2020

Impact Measure	Multiplier
Output	2.2
Income	1.5
Jobs	2.1
State and Local Taxes	2.0
Total All Taxes and Fees	\$177.7

Source: Pinnacle Economics using life science research data and the IMPLAN model.

An alternate measure of the linkages between life science research and the rest of the Oregon economy can be assessed or quantified by calculating how much total activity is supported by \$1.0 million in life science research spending. (See Table 26.) On average, \$1 million in spending by life science research supports a total of just under \$2.2 million in statewide economic activity, including \$1,124,000 in income, 14.1 jobs, and 104,300 in tax and fee revenues for state and local governments.

Table 26
Total Economic and Fiscal Contributions Per \$1 Million in Life Science Research Spending, 2020

Impact Measure	Per \$1 Million in Direct Spending
Output	\$2,182,900
Income	\$1,124,000
Jobs	14.1
State and Local Taxes	\$104,300
Total All Taxes and Fees	\$177.7

Source: Pinnacle Economics using life science research data and the IMPLAN model.

The Bioscience Industry (Combined) in Oregon, 2020

This section of the report combines the results of private bioscience and life science research and describes the direct and total economic impacts of the bioscience industry in Oregon in 2020.

Direct Impacts of the Bioscience Industry in Oregon, 2020

Altogether, the bioscience industry in Oregon directly generated \$8.4 billion in economic activity, including \$4.1 billion in value added production (Gross State Product), \$2.0 billion in wages, and 22,690 jobs in Oregon in 2020. Oregon's bioscience industry exported over \$4.4 billion in output (53 percent of direct industry output) in 2020.

Sources: Pinnacle Economics using QCEW data, life science research data, and IMPLAN.

Table 27
Direct Economic Impacts of the Bioscience Industry in Oregon, 2020 (\$ millions*)

Impact Measure	Private Bioscience	Life Science Research	Total
Bioscience*	\$0.9	\$0.7	\$3.1
Jobs	16,820	5,870	22,690
Output*	\$7,560.5	\$882.3	\$8,442.9
Gross State Product (a+b+c)*	\$3,394.0	\$744.6	\$4,138.6
a) Income*	\$1,804.0	\$643.8	\$2,447.8
• Wages*	\$1,487.6	\$522.8	\$2,010.4
b) Other Income*	\$1,417.7	\$81.4	\$1,499.1
c) Indirect Business Taxes*	\$172.3	\$19.5	\$191.8
Exports*	\$4,357.9	\$83.7	\$4,441.6
Exports % of Output	57.6%	9.5%	52.6%
Average Annual Wage (\$)	\$88,440	\$89,074	\$88,604
Total Federal*	\$132.6	\$26.3	\$206.1
Total All Taxes and Fees*	\$177.7	\$40.0	\$298.1

Table 28
Direct Bioscience Employment by Demographic Group, 2020

Demographic Group	Private Bioscience	Life Science Research	Total Bioscience	% of Total Bioscience
Gender				
Men	10,728	1,514	12,242	54.0%
Women	6,092	4,355	10,447	46.0%
Total	16,820	5,870	22,690	100.0%
Race				
White	12,924	4,987	17,911	78.9%
All Minorities	3,896	883	4,778	21.1%
• Black	324	146	470	2.1%
• Hispanic	1,442	290	1,733	7.6%
• Asian	1,525	250	1,775	7.8%
• All Other Races	605	196	801	3.5%
Total	16,820	5,870	22,690	100.0%

Table 28 shows the direct employment of Oregon’s bioscience industry by gender and race. In 2020, Oregon’s bioscience industry directly employed 10,447 women (46 percent of total bioscience employment) and 4,778 minority (21 percent) persons.

Sources: Pinnacle Economics using and QCEW data, life science research data, and an EEOC-augmented IMPLAN model of Oregon.

The direct tax and fee revenues generated by the bioscience industry and its employees are shown in Table 29, by taxing jurisdiction. In 2020, the bioscience industry directly generated \$291.0 million in tax and fee revenues for state and local governments, and \$552.9 million in tax and fee revenues for federal government.

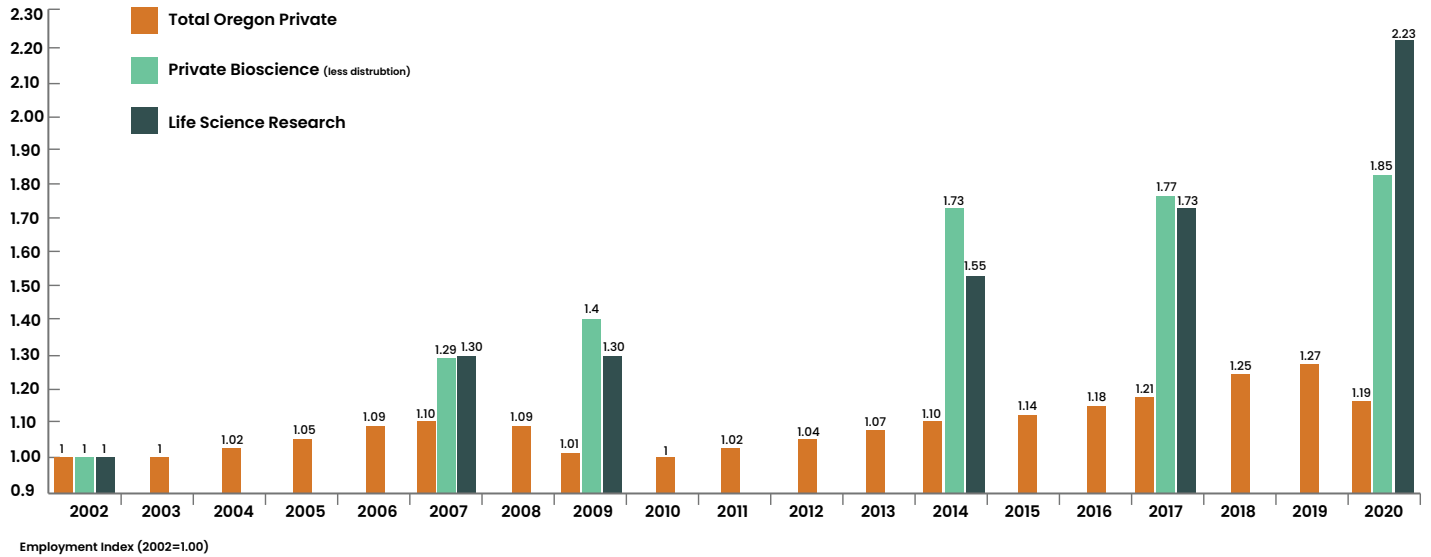
Table 29
Direct Fiscal Impacts of Bioscience in Oregon, 2020 (\$ millions)

Taxing Jurisdiction / General Tax or Fee Category	Private Bioscience	Life Science Research	Total Bioscience
State and Local			
Corporate Profits and Dividends	\$15.5	\$0.9	\$16.4
Business and Personal Property	\$95.5	\$10.9	\$106.4
Personal Income	\$61.0	\$21.0	\$81.9
Social Insurance	\$6.7	\$2.4	\$9.1
Other Taxes	\$53.9	\$6.4	\$60.2
Fines, Fees and Non-taxes	\$13.3	\$3.5	\$16.9
Total State and Local	\$245.9	\$45.0	\$291.0
Federal			
Corporate Profits and Dividends	\$31.8	\$1.8	\$33.6
Personal Income	\$122.5	\$42.1	\$164.7
Business Other Taxes and Fees	\$21.7	\$2.4	\$24.1
Social Insurance	\$244.3	\$86.3	\$330.6
Total Federal	\$420.3	\$132.6	\$552.9
Total All Taxes	\$666.2	\$177.7	\$843.9

Sources: Pinnacle Economics using QCEW and life science research employment data, and IMPLAN.

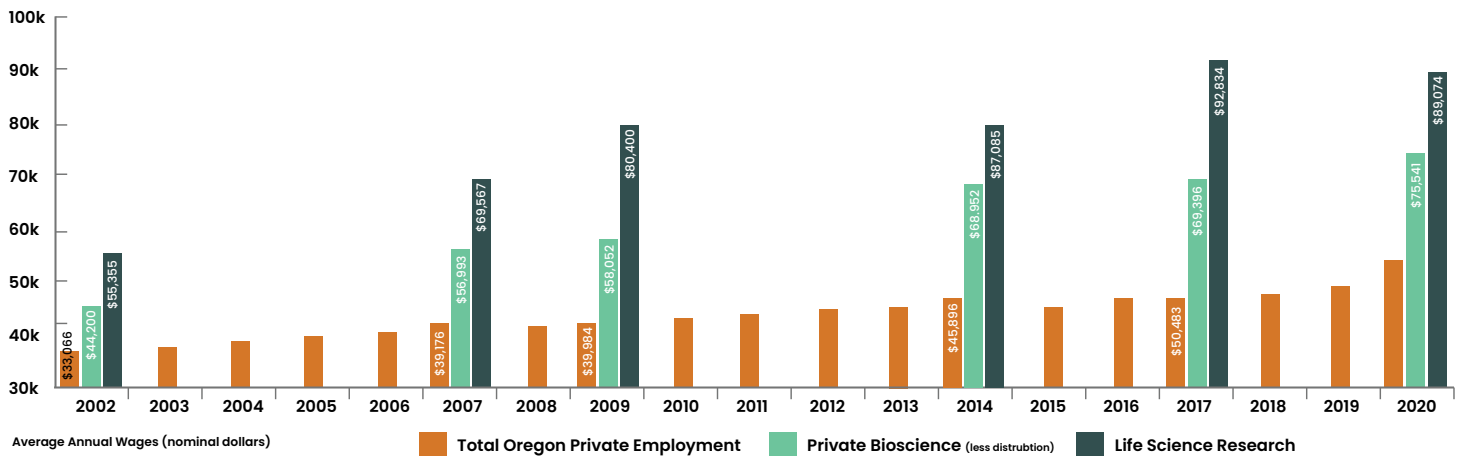
The following two figures compare employment and average annual wages of private bioscience and life science research to all private employment in Oregon between 2002 and 2020.

Figure 10
Bioscience Sectors and All Private Sector Employment, 2002–2020



Note: In order to accommodate changes to the industry definition in 2014, bioscience-related distribution and four subsectors are not included in private bioscience when making comparisons to 2002.

Figure 11
Bioscience Sectors and All Private Sector Average Annual Wages, 2002–2020 (nominal dollars)



Note: In order to accommodate changes to the industry definition in 2014, bioscience-related distribution and four subsectors are not included in private bioscience when making comparisons to 2002.

Sources: Pinnacle Economics using QCEW data and life science research data.

In 2020, the bioscience industry in Oregon directly employed 22,690 persons and paid over \$2.0 billion in wages. Growth in the industry has been steady and significant over the last 18 years. Between 2002 and 2020, after adjusting for bioscience-related distribution (a new sector added in the 2014 study), bioscience added over 8,500 jobs (+96 percent) and increased payrolls by \$970.6 million (+231 percent).

Total Impacts of the Bioscience Industry in Oregon, 2020

This section presents the total impacts of the combined (private bioscience plus life science research) bioscience industry in Oregon in 2020. The direct, indirect and induced impacts associated with the bioscience industry in Oregon are shown in Table 30. **In 2020, the bioscience industry in Oregon is associated with \$15.7 billion in output, including \$5.0 billion in income, \$2.9 billion in other income, and 65,932 jobs.** The secondary impacts include:

- **Indirect** or supply-chain impacts of \$3.9 billion in economic activity, including \$1.5 billion in income, and 21,331 jobs. Just over 20 percent of these indirect impacts accrue to the professional and technical services sectors, benefiting employees and firms in marketing, management services, accounting, legal, advertising, and architectural and engineering services.
- **Induced** or consumption-driven impacts of \$3.3 billion in output, including \$1.1 billion in income, and 21,912 jobs. Induced impacts are concentrated in the state's trade and service sectors. As a result, additional economic activity is generated in sectors with relatively high concentrations of women and minority employment, as well as workers of various skill levels.

Table 30
Total Economic Impacts of the Bioscience Industry in Oregon, by Type of Impact, 2020 (\$ millions*)

Impact Measure	Direct	Indirect	Induced	Total
Jobs	22,690	21,331	21,912	65,932
Output*	\$8,442.9	\$3,884.1	\$3,372.5	\$15,699.5
Gross State Product*	\$4,138.6	\$2,155.0	\$1,988.1	\$8,281.7
• Income*	\$2,447.8	\$1,460.7	\$1,122.8	\$5,031.3
• Other Income*	\$1,568.9	\$604.0	\$732.5	\$2,905.5
• Indirect Business Taxes*	\$1,437.2	\$90.3	\$132.7	\$1,660.1

Source: Pinnacle Economics using QCEW data, life science research data, and the IMPLAN model.

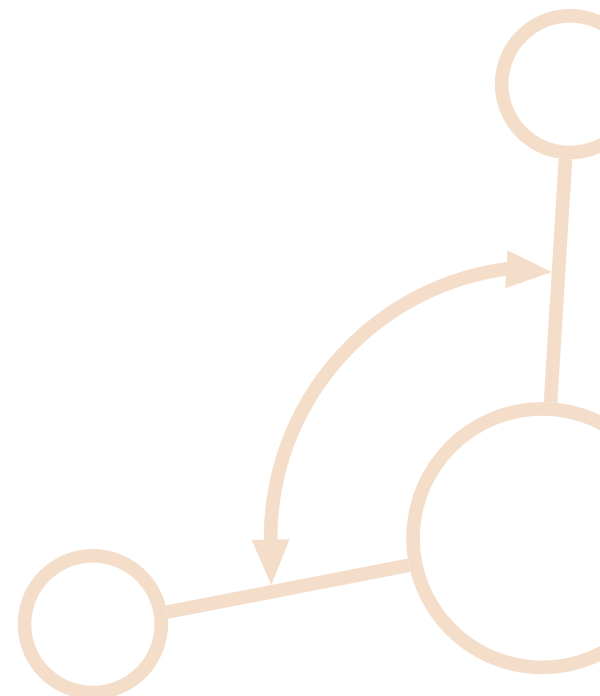


Table 31 reports the total economic impacts, by aggregate industry sector, and demonstrates how the direct economic activity attributed to Oregon’s bioscience industry benefits other sectors of the economy.

Table 31
Total Economic Impacts of the Bioscience Industry by Aggregate Industry Sector, 2020 (\$ millions)

Aggregate Industry Sector	Output	Income	Jobs
Agriculture, forestry, fishing and hunting	\$24.6	\$9.2	276
Mining	\$9.0	\$0.6	38
Utilities	\$155.0	\$19.6	135
Construction	\$74.8	\$24.0	348
Manufacturing	\$3,727.8	\$670.4	7,447
Wholesale trade	\$3,543.7	\$940.6	7,555
Retail trade	\$321.5	\$143.2	3,908
Transportation and warehousing	\$389.8	\$153.1	2,717
Information services	\$352.0	\$85.5	867
Finance, insurance and real estate	\$1,857.0	\$277.2	5,456
Professional and technical services	\$1,580.2	\$642.3	7,809
Management of companies and enterprises	\$448.9	\$277.2	2,004
Administrative and waste services	\$428.2	\$217.8	4,920
Educational services	\$256.1	\$171.4	2,118
Health care and social assistance	\$1,695.7	\$1,008.6	11,327
Arts, entertainment and recreation	\$74.3	\$32.0	1,205
Accommodation and food services	\$265.4	\$107.4	3,714
Other services, except public administration	\$273.4	\$156.2	2,911
Government and unclassified sectors	\$222.1	\$94.9	1,177
Total All Sectors	\$15,699.5	\$5,031.3	65,932

Sources: Pinnacle Economics using QCEW and life science research data, and IMPLAN.



The bioscience industry in Oregon directly employed approximately 10,450 women and 4,800 minority workers in 2020. Through supply-chain and consumption-driven spending, the bioscience industry is associated with jobs for women and minority workers in other industry sectors. In total, the bioscience industry is linked to almost 29,900 jobs for women and 14,450 jobs for minority workers in Oregon in 2020.

Table 32
Bioscience Industry Employment Impacts by Demographic Group and Type of Impact, 2020

Demographic Group	Direct	Indirect	Induced	Total	% of Total
Gender					
Men	12,242	12,984	10,823	36,049	54.7%
Women	10,447	8,347	11,089	29,883	45.3%
Total	22,690	21,331	21,912	65,932	100.0%
Race					
White	17,911	16,737	16,842	51,490	78.1%
Total All Minorities	4,778	4,594	5,070	14,442	21.9%
• Black	470	664	696	1,831	2.8%
• Hispanic	1,733	1,952	2,422	6,107	9.3%
• Asian	1,775	1,109	1,021	3,905	5.9%
• All Other Races	801	869	930	2,600	3.9%
Total	22,690	21,331	21,912	65,932	100.0%

Sources: Pinnacle Economics Gender and Race Employment Calculator, QCEW and life science data, and IMPLAN.

The fiscal impacts attributed to Oregon’s bioscience industry are shown in Table 33. The direct, indirect and induced economic activity associated with the bioscience industry is linked to a total of \$609.6 million in state and local tax revenues and \$1.1 billion in federal tax revenues.

Table 33
Fiscal Impacts of the Bioscience Industry in Oregon, by Type of Impact, 2020 (\$ millions)

Taxing Jurisdiction / General Tax or Fee Category	Direct	Indirect	Induced	Total
State and Local				
Corporate Profits and Dividends	\$16.4	\$6.5	\$7.9	\$30.8
Business and Personal Property	\$106.4	\$49.9	\$72.9	\$229.2
Personal Income	\$81.9	\$48.4	\$37.2	\$167.6
Social Insurance	\$9.1	\$4.7	\$3.6	\$17.4
Other Taxes	\$60.2	\$28.4	\$41.0	\$129.6
Fines, Fees and Non-taxes	\$16.9	\$9.3	\$8.9	\$35.1
Total State and Local	\$291.0	\$147.2	\$171.4	\$609.6
Federal				
Corporate Profits and Dividends	\$33.6	\$13.4	\$16.2	\$63.1
Personal Income	\$164.7	\$97.2	\$74.8	\$336.8
Other Business	\$24.1	\$11.3	\$16.6	\$51.9
Social Insurance	\$330.6	\$176.2	\$134.7	\$641.5
Total Federal	\$552.9	\$298.0	\$242.3	\$1,093.3
Total All Taxes and Fees	\$843.9	\$445.2	\$413.7	\$1,702.8

Sources: Pinnacle Economics using QCEW and life science research data, and IMPLAN.



THE BIOSCIENCE INDUSTRY IN CLARK COUNTY, WASHINGTON

For the first time, this study measures the bioscience industry in Clark County, Washington. The data sources, industry definition, and modeling framework are similar to that used for Oregon’s bioscience industry. Although private bioscience and life science research are measured separately, they are combined in this section given the relatively limited nature of life science research activities in the Clark County. Direct impacts are reported first, followed by the total economic impacts.

Private bioscience data. The Washington Employment Security Department’s Labor Market and Economic Analysis (LMEA) department provided QCEW establishment, payroll, and employment data for NAICS codes included in private bioscience for Clark County, Washington. This NAICS code definition is based on TEconomy/BIO’s 2020 report and is the same definition of private bioscience used in the Oregon analysis. (Note: The agriculture, feedstocks, and chemicals sector does not exist in Clark County in 2020, or was not available due to confidentiality constraints.)

Life science research data. Washington State University (WSU) provided life science research funding at their Vancouver campus for CY2020. Pinnacle used data for life science research at universities in Oregon to estimate direct employment and payroll for life science research at WSU’s Vancouver campus.

Direct Impacts of Private Bioscience and Life Science Research in Clark County in 2020 (\$ millions)

In 2020, private bioscience in Clark County included 150 firms that directly generated \$1.4 billion in output, included \$271.8 million in income and 2,456 jobs. Income includes \$228.4 million in wages (as reported by LMEA’s QCEW data) and \$43.5 million in benefits and payroll taxes (as estimated using IMPLAN). The average annual wage in private bioscience is \$93,000 or 54 percent greater than the average annual wage for all private employers in Clark County. Private bioscience in Clark County exported \$1.2 billion in goods and services (85.7 percent of direct output) in 2020. Traded sectors and exports are important to the Clark County economy because it brings new money into the county rather than simply recycling existing dollars or purchasing power.

Table 34

Direct Economic Impacts of Private Bioscience in Clark County, by Sector, 2020 (\$ millions*)

Economic Measure	Drugs and Pharmaceuticals	Medical Devices and Equipment	Research, Testing and Medical Laboratories	Bioscience-related Distribution	Total All Private Bioscience
# Establishments	12	17	51	70	150
Jobs	589	327	979	561	2,456
Output*	\$433.2	\$145.2	\$566.0	\$237.9	\$1,382.3
Gross Regional Product (a+b+c)*	\$111.7	\$45.6	\$272.4	\$106.2	\$536.0
a) Income*	\$39.6	\$27.8	\$163.2	\$41.2	\$271.8
• Wages*	\$30.4	\$21.3	\$141.5	\$35.2	\$228.4
b) Profits*	\$61.0	\$16.0	\$102.5	\$53.7	\$233.2
c) Business Taxes*	\$11.1	\$1.8	\$6.7	\$11.3	\$30.9
Exports (d+e)*	\$409.9	\$137.6	\$472.8	\$164.1	\$1,184.5
d) Domestic Exports*	\$374.1	\$114.1	\$266.4	\$134.0	\$888.7
e) Foreign Exports*	\$35.8	\$23.5	\$206.4	\$30.1	\$295.7
Exports % of Output	94.6%	94.8%	83.5%	69.0%	85.7%

Sources: Pinnacle Economics Gender and Race Employment Calculator, QCEW and life science data, and IMPLAN.



The direct economic impacts for private bioscience and life science research are shown separately and then aggregated in Table 35. Combined, Clark County’s bioscience industry directly generated \$1.4 billion in output, including \$274.3 million in income and 2,478 jobs.

Table 35
Direct Economic Impacts of Private Bioscience and Life Science Research in Clark County, 2020 (\$ millions*)

Economic Measure	Private Bioscience	Life Science Research	Total Bioscience
# Establishments	150	1	151
Jobs	2,456	23	2,478
Output*	\$1,382.3	\$3.1	\$1,385.4
Gross Regional Product (a+b+c)*	\$536.0	\$2.9	\$538.9
a) Income*	\$271.8	\$2.4	\$274.3
• Wages*	\$228.4	\$2.0	\$230.3
b) Profits*	\$233.2	\$0.4	\$233.6
c) Business Taxes*	\$30.9	\$0.1	\$31.0
Exports (d+e)*	\$1,184.5	\$2.6	\$1,187.0
d) Domestic Exports*	\$888.7	\$2.6	\$891.3
e) Foreign Exports*	\$295.7	\$0.0	\$295.8
Exports % of Output	85.7%	83.5%	85.7%

Sources: Pinnacle Economics using QCEW data, life science research funding from WSU Vancouver, and an IMPLAN model of Clark County.

In 2020, private bioscience and their employees generated \$30.5 million in tax and fee revenues for state and local governments, and \$63.8 million in tax and fee revenues for the federal government. (See Table 36.)

Table 36
Direct Fiscal Impacts of Private Bioscience in Clark County, by Sector, 2020

Taxing Jurisdiction / General Tax or Fee Category	Drugs and Pharmaceuticals	Medical Devices and Equipment	Research, Testing and Medical Laboratories	Bioscience-related Distribution	Total All Private Bioscience
State and Local					
Business and Personal Property	\$3,796,300	\$383,800	\$2,313,700	\$3,882,400	\$10,376,200
Sales Taxes	\$5,342,900	\$536,000	\$3,218,100	\$5,463,800	\$14,560,800
Social Insurance	\$323,900	\$156,700	\$1,332,900	\$337,200	\$2,150,700
Other Taxes	\$954,500	\$99,500	\$609,600	\$976,300	\$2,639,900
Fines, Fees and Non-taxes	\$234,700	\$37,100	\$265,700	\$240,700	\$778,200
Total State and Local	\$10,652,400	\$1,213,200	\$7,740,000	\$10,900,300	\$30,505,800
Federal					
Corporate Profits and Dividends	\$1,913,400	\$255,500	\$3,210,700	\$1,685,700	\$7,065,300
Personal Income	\$2,999,000	\$1,450,300	\$12,340,000	\$3,121,700	\$19,911,000
Business Other Taxes and Fees	\$818,900	\$82,200	\$493,200	\$837,400	\$2,231,700
Social Insurance	\$5,206,900	\$2,518,100	\$21,425,000	\$5,420,000	\$34,570,000
Total Federal	\$10,938,300	\$4,306,000	\$37,468,900	\$11,064,800	\$63,778,000
Total All Taxes	\$21,590,600	\$5,519,200	\$45,208,900	\$21,965,100	\$94,283,800

Sources: Pinnacle Economics using QCEW data and an IMPLAN model of Clark County.



Table 37 reports the direct fiscal impacts for each segment of the bioscience industry and for the industry as a whole.

Table 37
Direct Fiscal Impacts of Private Bioscience and Life Science Research in Clark County, 2020

Taxing Jurisdiction / General Tax or Fee Category	Total Private Bioscience	Life Science Research	Total Bioscience
State and Local			
Business and Personal Property	\$10,376,200	\$31,100	\$10,407,300
Sales Taxes	\$14,560,800	\$43,300	\$14,604,100
Social Insurance	\$2,150,700	\$16,200	\$2,166,900
Other Taxes	\$2,639,900	\$8,100	\$2,648,000
Fines, Fees and Non-taxes	\$778,200	\$3,400	\$781,600
Total State and Local	\$30,505,800	\$102,100	\$30,607,900
Federal			
Corporate Profits and Dividends	\$7,065,300	\$26,900	\$7,092,200
Personal Income	\$19,911,000	\$193,700	\$20,104,700
Business Other Taxes and Fees	\$2,231,700	\$14,800	\$2,246,500
Social Insurance	\$34,570,000	\$321,700	\$34,891,700
Total Federal	\$63,778,000	\$557,100	\$64,335,100
Total All Taxes	\$94,283,800	\$659,200	\$94,943,000

Sources: Pinnacle Economics using QCEW data, life science research funding from WSU Vancouver, and an IMPLAN model of Clark County.

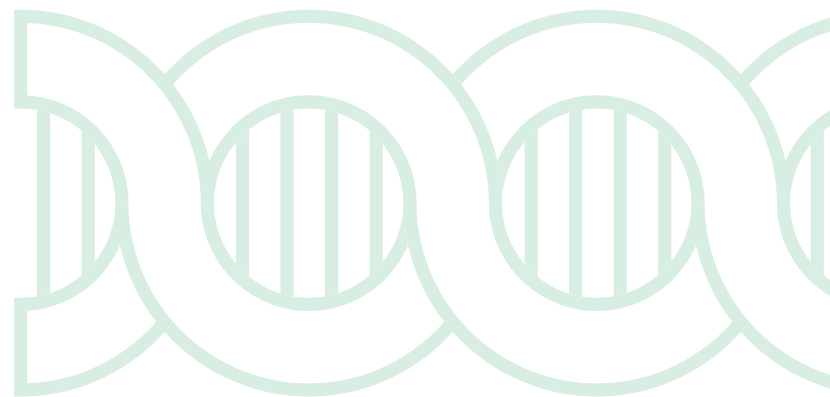




Table 38 reports the economic impacts, by type of impact, for each segment of Clark County's bioscience industry.

Table 38

Economic Impacts of Private Bioscience and Life Science Research in Clark County, by Type of Impact, 2020

BIOSCIENCE SEGMENT / Impact Measure	Direct	Indirect	Induced	Total
PRIVATE BIOSCIENCE				
Jobs	2,456	1,855	1,065	5,376
Output	\$1,382,255,800	\$319,118,600	\$163,198,700	\$1,864,573,100
Gross State Product	\$535,977,600	\$158,279,000	\$99,141,600	\$793,398,100
• Income	\$271,814,400	\$91,381,600	\$50,198,100	\$413,394,100
• Other Income	\$233,246,300	\$54,042,300	\$36,422,500	\$323,711,100
• Indirect Business Taxes	\$30,916,900	\$12,855,000	\$12,521,000	\$56,292,900
LIFE SCIENCE RESEARCH				
Jobs	23	5	6	34
Output	\$3,100,000	\$1,047,900	\$991,800	\$5,139,700
Gross State Product	\$2,915,900	\$437,500	\$580,300	\$3,933,700
• Income	\$2,435,800	\$163,600	\$275,500	\$2,874,900
• Other Income	\$390,100	\$241,000	\$227,100	\$858,200
• Indirect Business Taxes	\$90,000	\$32,900	\$77,700	\$200,600
TOTAL BIOSCIENCE				
Jobs	2,478	1,861	1,071	5,410
Output	\$1,385,355,800	\$320,166,500	\$164,190,500	\$1,869,712,800
Gross State Product	\$538,893,500	\$158,716,500	\$99,721,900	\$797,331,800
• Income	\$274,250,200	\$91,545,200	\$50,473,600	\$416,269,000
• Other Income	\$233,636,400	\$54,283,300	\$36,649,600	\$324,569,300
• Indirect Business Taxes	\$31,006,900	\$12,887,900	\$12,598,700	\$56,493,500

Sources: Pinnacle Economics using QCEW data, life science research funding from WSU Vancouver, and an IMPLAN model of Clark County.

The total economic impacts of private bioscience in Clark County in 2020 amount to almost \$1.9 billion in output, including \$413.4 million in income and 5,410 jobs. The economic impacts, by type of impact, of private bioscience in Clark County in 2020 include:

- **Direct** impacts of \$1.4 billion in output, including \$271.8 million in income, \$233.2 million in other income and 2,456 jobs. (These are the direct impacts of the industry reported in Table 35.)
- **Indirect** or supply-chain impacts of \$319.1 million in economic activity, including \$91.4 million in income and 1,855 jobs.
- **Induced** or consumption-driven impacts of \$163.2 million in economic activity, including \$50.2 million in income and 1,065 jobs. These relatively large induced impacts are attributed to the high-paying jobs in private bioscience (average annual wage of \$93,000 in 2020), as well as indirect impacts in Clark County that accrue to high-wage sectors.



Table 39
Total Bioscience Economic Impacts in Clark County, by Aggregate Industry Sector, 2020

Aggregate Industry Sector	Output	Income	Jobs
Agriculture, forestry, fishing and hunting	\$878,000	\$502,900	33
Mining	\$257,700	\$25,500	1
Utilities	\$724,300	\$85,300	1
Construction	\$7,811,500	\$2,206,000	34
Manufacturing	\$584,234,200	\$68,622,900	935
Wholesale trade	\$283,141,800	\$50,947,500	662
Retail trade	\$18,904,900	\$7,581,200	198
Transportation and warehousing	\$16,008,600	\$4,782,300	211
Information services	\$13,018,400	\$2,878,500	33
Finance, insurance and real estate	\$150,664,800	\$16,620,900	505
Professional and technical services	\$616,061,700	\$179,606,600	1,237
Management of companies and enterprises	\$8,923,300	\$4,620,400	41
Administrative and waste services	\$42,281,000	\$20,903,700	485
Educational services	\$4,529,200	\$3,075,000	44
Health care and social assistance	\$54,696,000	\$27,300,200	436
Arts, entertainment and recreation	\$2,596,100	\$504,400	43
Accommodation and food services	\$18,095,000	\$6,489,200	225
Other services, except public administration	\$19,158,400	\$11,324,900	191
Government and unclassified sectors	\$27,728,200	\$8,191,300	97
	\$1,869,712,800	\$416,269,000	5,410

Sources: Pinnacle Economics using QCEW data, life science research funding from WSU Vancouver, and an IMPLAN model of Clark County.

Table 40 summarizes the fiscal impacts, by type of impact, for each segment of Clark County’s bioscience industry. Table 41 then offers additional details regarding the fiscal impacts for Clark County’s bioscience industry as a whole.

Table 40
Summary of Fiscal Impacts for Each Segment of Clark County’s Bioscience Industry, by Type of Impact, 2020

BIOSCIENCE SEGMENT / Impact Measure	Direct	Indirect	Induced	Total
PRIVATE BIOSCIENCE				
State and Local	\$30,505,900	\$12,598,700	\$13,494,000	\$56,598,600
Federal	\$63,778,000	\$20,643,700	\$12,201,300	\$96,623,000
Total All Taxes	\$94,283,900	\$33,242,400	\$25,695,300	\$153,221,600
LIFE SCIENCE RESEARCH				
State and Local	\$102,100	\$32,100	\$74,500	\$208,700
Federal	\$557,100	\$52,300	\$75,500	\$684,900
Total All Taxes	\$659,200	\$84,400	\$150,000	\$893,600
TOTAL BIOSCIENCE				
State and Local	\$30,608,000	\$12,630,800	\$13,568,500	\$56,807,300
Federal	\$64,335,100	\$20,696,000	\$12,276,800	\$97,307,900
Total All Taxes	\$94,943,100	\$33,326,800	\$25,845,300	\$154,115,200

Sources: Pinnacle Economics using QCEW data, life science research funding from WSU Vancouver, and an IMPLAN model of Clark County.



Table 41

Detailed Fiscal Impacts for Clark County's (Combined) Bioscience Industry, by Type of Impact, 2020

Taxing Jurisdiction / General Tax or Fee Category	Direct	Indirect	Induced	Total
State and Local				
Business and Personal Property	\$10,407,300	\$4,404,600	\$4,815,500	\$19,627,400
Sales Taxes	\$14,604,100	\$6,185,700	\$6,773,100	\$27,562,900
Social Insurance	\$2,166,900	\$609,100	\$455,400	\$3,231,400
Other Taxes	\$2,648,000	\$1,118,200	\$1,214,300	\$4,980,500
Fines, Fees and Non-taxes	\$781,500	\$313,200	\$310,100	\$1,404,800
Total State and Local	\$30,608,000	\$12,630,800	\$13,568,500	\$56,807,300
Federal				
Corporate Profits and Dividends	\$7,092,200	\$1,695,100	\$1,155,500	\$9,942,800
Personal Income	\$20,104,700	\$7,586,500	\$4,073,100	\$31,764,300
Business Other Taxes and Fees	\$2,246,500	\$948,100	\$930,100	\$4,124,700
Social Insurance	\$34,891,800	\$10,466,400	\$6,118,000	\$51,476,200
Total Federal	\$64,335,100	\$20,696,000	\$12,276,800	\$97,307,900
Total All Taxes	\$94,943,100	\$33,326,800	\$25,845,300	\$154,115,200

Sources: Pinnacle Economics using QCEW data, life science research funding from WSU Vancouver, and an IMPLAN model of Clark County.

The economic and fiscal impact multipliers for each segment of Clark County's bioscience industry are reported in Table 42. Impact multipliers are used to assess the linkages between a given activity and other sectors of the local economy. In this analysis, impact multipliers are used to quantify the linkages between the bioscience industry in Clark County and other sectors of the county economy. Importantly, all else the same, economic and fiscal impact multipliers will be smaller for economic study areas that are defined more narrowly. This is due to the fact that multipliers are inversely related to leakages or imports, i.e., the greater the propensity to import, the lower the multipliers.

Table 42

Economic Impact Multipliers for Each Segment of Clark County's Bioscience Industry, 2020

Impact Measure	Total Private Bioscience	Life Science Research
Output	1.3	1.7
Income	1.5	1.2
Jobs	2.2	1.5
State and Local Taxes	1.9	1.2

Sources: Pinnacle Economics using QCEW data, life science research funding from WSU Vancouver, and an IMPLAN model of Clark County.

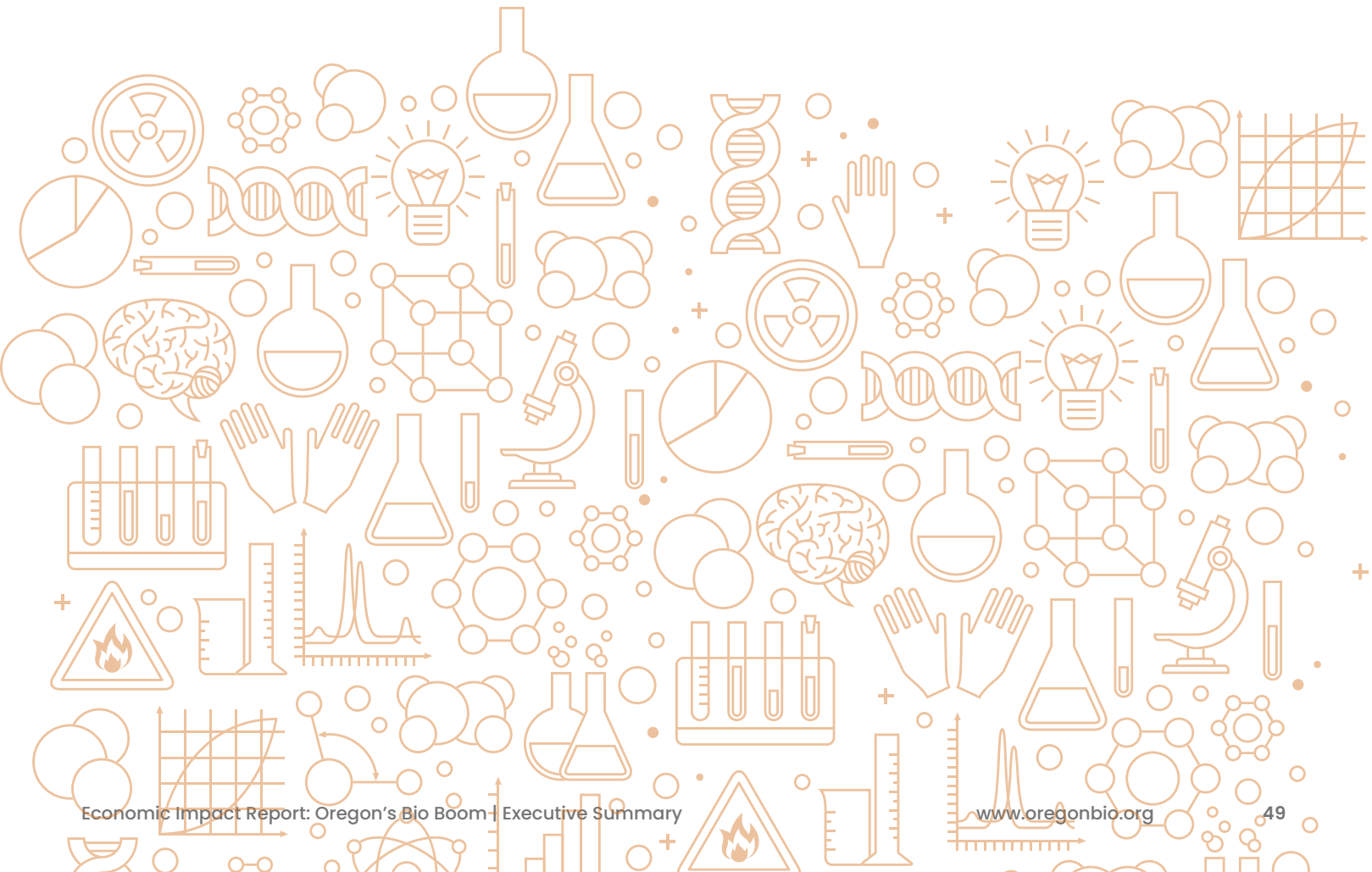
According to the economic impact model of Clark County, the private bioscience industry has the following multipliers:

- An **income multiplier of 1.5**, which shows that every \$1 million in income directly generated in the bioscience industry is linked to another \$500,000 in income for workers and business owners in other industries in Clark County.
- An **employment multiplier of 2.2**, which suggests that every 10 jobs in the bioscience industry supports an additional 12 jobs in other sectors of the Clark County economy.

Table 43
Economic Impacts Per \$1 Million in Output, 2020

Impact Measure	Total Private Bioscience	Life Science Research
Output	\$1,348,900	\$1,658,000
Income	\$299,100	\$927,400
Jobs	3.9	11.1
State and Local Taxes	\$40,900	\$67,305

Sources: Pinnacle Economics using QCEW data, life science research funding from WSU Vancouver, and an IMPLAN model of Clark County.



The following tables report the economic contributions for each of the five sectors in private bioscience in Oregon.

Impacts of Agricultural Feed Stocks and Chemicals (\$ millions*)

Table A1 | Summary Table

Impact Measure	Direct	Indirect	Induced	Total
Output*	\$544.9	\$248.6	\$114.8	\$908.3
Gross State Product*	\$109.2	\$128.5	\$67.7	\$305.4
• Income*	\$56.5	\$76.0	\$38.2	\$170.7
• Other Income*	\$44.7	\$40.6	\$24.9	\$110.3
• Indirect Business Taxes*	\$8.0	\$11.9	\$4.5	\$24.4
Jobs	562	1,072	746	2,380

Table A2 | Diversity Impacts

Demographic Group	Direct	Indirect	Induced	Total	% of Total
Gender					
Men	401	718	368	1,488	62.5%
Women	161	354	377	892	37.5%
Total	562	1,072	746	2,380	100.0%
Race					
White	415	823	573	1,811	76.1%
All Minorities	147	250	173	570	23.9%
• Black	11	31	24	66	2.8%
• Hispanic	49	129	82	261	11.0%
• Asian	69	47	35	151	6.4%
• All Other Races	18	42	32	92	3.8%
Total	562	1,072	746	2,380	100.0%

Impacts of Agricultural Feed Stocks and Chemicals (\$ millions)

Table 3: Fiscal Impacts

Taxing Jurisdiction / General Tax or Fee Category	Direct	Indirect	Induced	Total
State and Local Governments	\$9.9	\$14.0	\$5.8	\$29.8
Corporate Profits and Dividends Taxes	\$0.5	\$0.4	\$0.3	\$1.2
Business and Personal Property Taxes	\$4.4	\$6.5	\$2.5	\$13.4
Personal Income Taxes	\$1.9	\$2.5	\$1.3	\$5.7
Social Insurance Taxes	\$0.2	\$0.2	\$0.1	\$0.6
Other Taxes	\$2.5	\$3.7	\$1.4	\$7.5
Fines, Fees and Non-taxes	\$0.5	\$0.7	\$0.3	\$1.5
Federal Government	\$13.5	\$16.7	\$8.3	\$38.5
Corporate Profits and Dividends Taxes	\$1.0	\$0.9	\$0.6	\$2.4
Personal Income Taxes	\$3.9	\$5.1	\$2.5	\$11.5
Business Other Taxes and Fees	\$1.0	\$1.5	\$0.6	\$3.0
Social Insurance Taxes	\$7.7	\$9.3	\$4.6	\$21.5
Total All Taxes and Fees	\$23.5	\$30.8	\$14.1	\$68.3

Table 4: Multipliers

Impact Measure	Multiplier
Output	1.7
Gross State Product	2.8
• Income	3.0
• Other Income	2.5
• Indirect Business Taxes	3.1
Jobs	4.2

Impacts of Drugs and Pharmaceuticals (\$ millions*)

Table 1: Summary Table

Impact Measure	Direct	Indirect	Induced	Total
Output*	\$1,142.9	\$484.9	\$239.2	\$1,867.0
Gross State Product*	\$292.3	\$260.1	\$141.0	\$693.4
• Income*	\$114.6	\$162.5	\$79.6	\$356.7
• Other Income*	\$139.4	\$86.6	\$52.0	\$278.0
• Indirect Business Taxes*	\$38.2	\$11.0	\$9.4	\$58.6
Jobs	1,399	1,999	1,554	4,952

Table A2 | Diversity Impacts

Demographic Group	Direct	Indirect	Induced	Total	% of Total
Gender					
Men	999	1,242	768	3,008	60.7%
Women	400	757	787	1,944	39.3%
Total	1,399	1,999	1,554	4,952	100.0%
Race					
White	1,032	1,572	1,195	3,798	76.7%
All Minorities	367	427	360	1,153	23.3%
• Black	29	60	49	138	2.8%
• Hispanic	123	178	172	472	9.5%
• Asian	172	109	72	354	7.1%
• All Other Races	44	80	66	190	3.8%
Total	1,399	1,999	1,554	4,952	100.0%

Impacts of Drugs and Pharmaceuticals (\$ millions)

Table 3: Fiscal Impacts

Taxing Jurisdiction / General Tax or Fee Category	Direct	Indirect	Induced	Total
State and Local Governments	\$41.2	\$17.3	\$12.1	\$70.6
Corporate Profits and Dividends Taxes	\$1.7	\$1.0	\$0.6	\$3.2
Business and Personal Property Taxes	\$21.5	\$6.0	\$5.1	\$32.7
Personal Income Taxes	\$3.9	\$5.3	\$2.6	\$11.8
Social Insurance Taxes	\$0.4	\$0.5	\$0.3	\$1.2
Other Taxes	\$12.0	\$3.4	\$2.9	\$18.3
Fines, Fees and Non-taxes	\$1.6	\$1.1	\$0.6	\$3.3
Federal Government	\$31.7	\$34.0	\$17.1	\$82.8
Corporate Profits and Dividends Taxes	\$3.6	\$2.0	\$1.1	\$6.6
Personal Income Taxes	\$7.8	\$10.7	\$5.3	\$23.7
Business Other Taxes and Fees	\$4.9	\$1.4	\$1.2	\$7.4
Social Insurance Taxes	\$15.5	\$20.0	\$9.5	\$45.0
Total All Taxes and Fees	\$72.9	\$51.3	\$29.1	\$153.4

Table 4: Multipliers

Impact Measure	Multiplier
Output	1.6
Gross State Product	2.4
• Income	3.1
• Other Income	2.0
• Indirect Business Taxes	1.5
Jobs	3.5

Impacts of Medical Devices and Equipment (\$ millions*)

Table 1: Summary Table

Impact Measure	Direct	Indirect	Induced	Total
Output*	\$1,766.2	\$685.3	\$609.5	\$3,061.0
Gross State Product*	\$685.9	\$390.0	\$359.3	\$1,435.1
• Income*	\$443.6	\$271.6	\$202.9	\$918.1
• Other Income*	\$216.1	\$101.5	\$132.4	\$450.1
• Indirect Business Taxes*	\$26.1	\$16.9	\$24.0	\$67.0
Jobs	4,614	3,489	3,960	12,062

Table A2 | Diversity Impacts

Demographic Group	Direct	Indirect	Induced	Total	% of Total
Gender					
Men	3,225	2,190	1,956	7,371	61.1%
Women	1,389	1,299	2,004	4,691	38.9%
Total	4,614	3,489	3,960	12,062	100.0%
Race					
White	3,181	2,754	3,043	8,979	74.4%
All Minorities	1,433	734	916	3,083	25.6%
• Black	85	97	126	308	2.6%
• Hispanic	490	296	438	1,224	10.1%
• Asian	743	202	185	1,130	9.4%
• All Other Races	115	139	168	422	3.5%
Total	4,614	3,489	3,960	12,062	100.0%

Impacts of Medical Devices and Equipment (\$ millions)

Table 3: Fiscal Impacts

Taxing Jurisdiction / General Tax or Fee Category	Direct	Indirect	Induced	Total
State and Local Governments	\$44.0	\$27.3	\$31.0	\$102.3
Corporate Profits and Dividends Taxes	\$2.3	\$1.1	\$1.4	\$4.8
Business and Personal Property Taxes	\$14.4	\$9.3	\$13.2	\$36.9
Personal Income Taxes	\$14.5	\$9.0	\$6.7	\$30.3
Social Insurance Taxes	\$1.7	\$0.9	\$0.6	\$3.2
Other Taxes	\$8.2	\$5.3	\$7.4	\$20.9
Fines, Fees and Non-taxes	\$2.8	\$1.7	\$1.6	\$6.1
Federal Government	\$96.9	\$55.7	\$43.8	\$196.4
Corporate Profits and Dividends Taxes	\$4.8	\$2.2	\$2.9	\$9.9
Personal Income Taxes	\$29.2	\$18.0	\$13.5	\$60.8
Business Other Taxes and Fees	\$3.3	\$2.1	\$3.0	\$8.4
Social Insurance Taxes	\$59.6	\$33.4	\$24.4	\$117.3
Total All Taxes and Fees	\$140.8	\$83.1	\$74.8	\$298.7

Table 4: Multipliers

Impact Measure	Multiplier
Output	1.7
Gross State Product	2.1
• Income	2.1
• Other Income	2.1
• Indirect Business Taxes	2.6
Jobs	2.6

Impacts of Research, Testing, and Medical Labs (\$ millions*)

Table 1: Summary Table

Impact Measure	Direct	Indirect	Induced	Total
Output*	\$1,268.8	\$546.7	\$589.8	\$2,405.3
Gross State Product*	\$765.9	\$304.3	\$347.7	\$1,417.9
• Income*	\$465.2	\$200.9	\$196.4	\$862.5
• Other Income*	\$284.5	\$93.1	\$128.1	\$505.7
• Indirect Business Taxes*	\$16.2	\$10.3	\$23.2	\$49.7
Jobs	4,926	3,161	3,832	11,919

Table A2 | Diversity Impacts

Demographic Group	Direct	Indirect	Induced	Total	% of Total
Gender					
Men	2,108	1,863	1,893	5,864	49.2%
Women	2,818	1,298	1,940	6,055	50.8%
Total	4,926	3,161	3,832	11,919	100.0%
Race					
White	4,087	2,501	2,946	9,534	80.0%
All Minorities	839	660	887	2,385	20.0%
• Black	95	89	122	306	2.6%
• Hispanic	232	272	424	928	7.8%
• Asian	353	170	179	702	5.9%
• All Other Races	159	128	163	449	3.8%
Total	4,926	3,161	3,832	11,919	100.0%

Impacts of Research, Testing, and Medical Labs (\$ millions)

Table 3: Fiscal Impacts

Taxing Jurisdiction / General Tax or Fee Category	Direct	Indirect	Induced	Total
State and Local Governments	\$38.0	\$18.5	\$30.0	\$86.5
Corporate Profits and Dividends Taxes	\$3.1	\$1.0	\$1.4	\$5.4
Business and Personal Property Taxes	\$9.0	\$5.7	\$12.8	\$27.5
Personal Income Taxes	\$16.2	\$6.7	\$6.5	\$29.4
Social Insurance Taxes	\$1.7	\$0.6	\$0.6	\$3.0
Other Taxes	\$5.3	\$3.3	\$7.2	\$15.7
Fines, Fees and Non-taxes	\$2.8	\$1.2	\$1.5	\$5.5
Federal Government	\$104.2	\$40.2	\$42.4	\$186.8
Corporate Profits and Dividends Taxes	\$6.3	\$2.1	\$2.8	\$11.2
Personal Income Taxes	\$32.5	\$13.5	\$13.1	\$59.0
Business Other Taxes and Fees	\$2.0	\$1.3	\$2.9	\$6.2
Social Insurance Taxes	\$63.5	\$23.4	\$23.6	\$110.4
Total All Taxes and Fees	\$142.2	\$58.7	\$72.4	\$273.3

Table 4: Multipliers

Impact Measure	Multiplier
Output	1.9
Gross State Product	1.9
• Income	1.9
• Other Income	1.8
• Indirect Business Taxes	3.1
Jobs	2.4

Impacts of Bioscience-related Distribution (\$ millions*)

Table 1: Summary Table

Impact Measure	Direct	Indirect	Induced	Total
Output*	\$2,837.8	\$1,530.7	\$1,163.3	\$5,531.9
Gross State Product*	\$1,540.8	\$866.0	\$685.8	\$3,092.6
• Income*	\$724.1	\$620.1	\$387.3	\$1,731.5
• Other Income*	\$732.9	\$214.1	\$252.7	\$1,199.7
• Indirect Business Taxes*	\$83.9	\$31.8	\$45.8	\$161.4
Jobs	5,319	9,312	7,559	22,189

Table A2 | Diversity Impacts

Demographic Group	Direct	Indirect	Induced	Total	% of Total
Gender					
Men	3,994	5,673	3,734	13,400	60.4%
Women	1,325	3,639	3,825	8,789	39.6%
Total	5,319	9,312	7,559	22,189	100.0%
Race					
White	4,210	7,299	5,810	17,318	78.0%
All Minorities	1,109	2,013	1,749	4,871	22.0%
• Black	104	314	240	658	3.0%
• Hispanic	548	843	836	2,227	10.0%
• Asian	186	474	352	1,013	4.6%
• All Other Races	270	382	321	973	4.4%
Total	5,319	9,312	7,559	22,189	100.0%

Impacts of Bioscience-related Distribution (\$ millions)

Table 3: Fiscal Impacts

Taxing Jurisdiction / General Tax or Fee Category	Direct	Indirect	Induced	Total
State and Local Governments	\$112.8	\$56.3	\$59.2	\$228.3
Corporate Profits and Dividends Taxes	\$7.9	\$2.3	\$2.7	\$12.9
Business and Personal Property Taxes	\$46.1	\$17.6	\$25.2	\$88.9
Personal Income Taxes	\$24.5	\$20.6	\$12.9	\$57.9
Social Insurance Taxes	\$2.7	\$2.0	\$1.2	\$5.9
Other Taxes	\$25.9	\$10.1	\$14.1	\$50.1
Fines, Fees and Non-taxes	\$5.7	\$3.8	\$3.1	\$12.6
Federal Government	\$173.9	\$125.1	\$83.6	\$382.7
Corporate Profits and Dividends Taxes	\$16.2	\$4.7	\$5.6	\$26.5
Personal Income Taxes	\$49.2	\$41.3	\$25.8	\$116.3
Business Other Taxes and Fees	\$10.5	\$4.0	\$5.7	\$20.1
Social Insurance Taxes	\$98.1	\$75.2	\$46.5	\$219.7
Total All Taxes and Fees	\$286.8	\$181.5	\$142.8	\$611.0

Table 4: Multipliers

Impact Measure	Multiplier
Output	1.9
Gross State Product	2.0
• Income	2.4
• Other Income	1.6
• Indirect Business Taxes	1.9
Jobs	4.2

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Oregon Bio, a member trade association, was formally established as a 501(c)(6) non-profit in 1989 by a consortium of universities, public officials, educators and bioscience executives to cultivate a regionally synergistic climate in which to build a bioscience community. Today, Oregon Bio supports the regional bioscience community through networking, workforce development, educational programs, enterprise support, advocacy and the promotion of research collaborations. As the collective voice for our bioscience community, Oregon Bio is responsible for communicating the industry's economic impact, issues and challenges to the public sector, educators and the general public. Oregon Bio continually seeks ways to promote and support sustainability and growth in the life science, biotechnology, digital health and device manufacturing sectors. Oregon Bio offers a host of member services to lower operational costs and promote partnering, so members can achieve their scientific, economic and social potential. Oregon Bio is an affiliate of the Biotechnology Innovation Organization.

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