

# THE ECONOMIC IMPACT AND PROFILE OF MONTANA BIOSCIENCE FIRMS

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# 1. The Economic Contributions of Montana's Bioscience Industry

This is a study of the activities and the economic contributions of what has arguably been one of the most important and most visible industries during the course of the COVID-19 pandemic: the Montana bioscience industry. Across the entire state, the manufacturers, research laboratories, medical facilities and equipment wholesalers who jointly comprise this important segment of the state economy have been an important source of economic growth and vitality. By drawing on both publicly available data as well as survey responses from Montana bioscience companies, this report presents a comprehensive picture of the industry's activities and how those activities support the economy as a whole.

Our basic finding is that Montana's bioscience industry is a diverse, rapidly growing, and high-paying segment of the economy. Specifically, we find that:

- In the pandemic year 2020 when state employment fell, Montana bioscience employment registered significant gains. Overall job growth between 2015 and 2020 was 30 percent, more than 12 times larger than job growth in the private sector as a whole.
- The average annual wage in the Montana bioscience industry was \$75,495 in 2020, more than 50 percent higher than the \$50,229 average paid to private sector jobs across all industries.
- Because of the presence of the bioscience industry in the state, there are 4,729 more jobs, \$450.8 million more in annual income received by Montana households, and \$918.4 million more in annual gross receipts of Montana business and non-business organizations.
- Bioscience companies who responded to the BBER survey anticipate considerable growth in 2022. Respondents projected strong increases in employment (31 percent), earnings (47 percent) and average annual wages (11 percent) in this year.
- As elsewhere in the economy, changes in the labor market have presented bioscience industry firms with challenges and opportunities. Access to capital and business or market development also are issues for bioscience firms who responded to the survey.

This project was produced by the Bureau of Business and Economic Research at the University of Montana (BBER). Established in 1948, the BBER is the preeminent business research organization in the state of Montana. The Bureau's mission is "to serve the general public, as well as people in business, labor, and government, by providing an understanding of the environment in which Montanans live and work." The project was supported by the Montana BioScience Alliance and the Montana Bioscience Cluster Initiative. All of the findings and conclusions in this report are those of the BBER.

This report combines three different information sources that describe Montana's bioscience industry. First, we draw from publicly available information on employment and wages of payroll workers at a detailed industry level, utilizing data from the U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW). Secondly, the BBER performed an



economic impact analysis of the industry to assess how its spending, production and employment ultimately support jobs and income throughout the economy. Finally, a third set of findings is based on a survey of bioscience firms in Montana that was administered by BBER during the beginning of 2022. The survey collected detailed information on the activities of bioscience firms in Montana, including the issues they face and their plans for the coming year.

### Key Montana Bioscience Industry Findings

- Employment in Montana's bioscience industry continued to grow in 2020, recording nearly 30 percent growth since 2015, 12 times the growth in private sector employment over the same period.
- Montana's bioscience industry had 2,701 workers in 2020/21, paying annual wages that were \$25,000 higher than the economy average.
- Five of six of the bioscience subsectors saw employment growth since 2014.
- Montana ranks 6<sup>th</sup> in bioscience job growth among all states over the past five years.

### Key Economic Impact Findings

The spending, production and jobs associated with Montana bioscience companies ultimately support jobs and income elsewhere in the economy. This occurs because spending is received as income to businesses and individuals, who, in turn, re-spend a portion of that income on other goods and services. By comparing the actual economy to a hypothetical economy in which the bioscience industry is not present, we find that the industry ultimately supports:

- 4,729 permanent, year-round jobs across a wide spectrum of industries throughout the state;
- More than \$450 million each year in annual income received by Montana households, of which \$393.5 million is after-tax;
- \$918 million in additional annual sales (gross receipts) to Montana business and non-business organizations;
- An addition 6,754 people across the state, dominated by those of working age and their children.

As the industry grows, these economic impacts can be expected to grow in the future.

## Key Bioscience Firm Survey Findings

From the survey responses received in early 2022 from the 36 bioscience firms that participated in the survey, we learned that:

- Firms anticipate increasing annual wages for employees in 2022 by an average of 11%.
- Firms earned an average of \$2,622,000 per firm in 2021. The combined revenue of these firms in 2021 was \$83,889,000.
- Firms anticipate a large increase in earnings in 2022, 47% on average per firm.
- The firms employed 488 people in Montana in 2021. The average responding bioscience firm employed 14 Montana workers in 2021.
- Firms anticipate adding 149 Montana jobs in 2022. This represents a nearly 31% increase in Montana employment over 2021.
- Seventy-one percent of firms' 2021 new hires came from people who lived in Montana, while 29% came from people who lived out-of-state.
- Almost 3 in 10 firms (27%) said it became harder to hire qualified new employees over 2021. Only 6% of firms said it became easier to hire new employees over 2021.
- Firms most often (20% of firms) cited access to capital as their firm's largest impediment to growth. Real estate costs and hiring issues were the next most frequently cited (14% of firms, respectively) impediments to faster growth.
- Firms most often cite (25% of firms) business development or market development as their firm's most pressing business issue. Access to capital was the next most often cited (14% of firms) pressing business issue.
- At the time this survey was conducted about 45% of the employees of the responding bioscience firms worked from home at least some of the time. This proportion is identical to the national proportion of employees (45%) who worked from home at least some of the time in 2021 according to a recent Gallup poll (Saad & Wigert, 2021).

## Report Overview

This report is organized in three sections. In the next section, we describe the bioscience industry and highlight its growth and prominence. This is followed by a section that describes its ultimate impact on the overall Montana economy in detail. Finally, we present the results of the Montana Bioscience Survey.

## 2. The Montana Bioscience Industry

During a global health emergency, a strong response from a state's bioscience industry is pivotal to overcoming the ongoing public health challenges. Montana's bioscience industry rose to that challenge contributing to the research and development of viral testing and vaccines while also producing the medical equipment needed to fight against COVID-19. In addition, despite entering a recession, other sectors of this industry continued to provide the food, pharmaceuticals, and preventative medicine necessary for healthy lives and commerce throughout the nation.

This industry's economic strength was shown prominently in how bioscience employment continued to grow when much of the state economy faltered. Bioscience's strength comes from its innovative workforce, economic diversity, and substantial involvement in human health. All three contribute to this recession-resistant sector in the state economy.

The following summarizes the industry's impressive growth, prominence in the state economy, and how the presence of bioscience firms in Montana compares to the rest of the nation.

### Definition of the Bioscience Industry

The bioscience industry is a diverse collection of companies that produce goods, services, and knowledge that involve the application of biological and scientific knowledge to living organisms. The industry is not formally defined by the North American Industry Classification System (NAICS) used by federal government statistical agencies. However, a standardized list of specific industries, in detailed NAICS codes, has emerged in studies of the industry conducted at the national level that we adopt in this report (Battelle/BIO/PMP Inc, 2012) (TEconomy/BIO 2020).

For this analysis, data from the U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages were collected for specific activities within manufacturing, research and development, health care, and wholesale trade industries. Table 1 outlines the specific North American Industry Classification System codes (NAICS) used to define the industry. These codes were adapted from national studies on the bioscience industry



Table 1: Bioscience subsectors

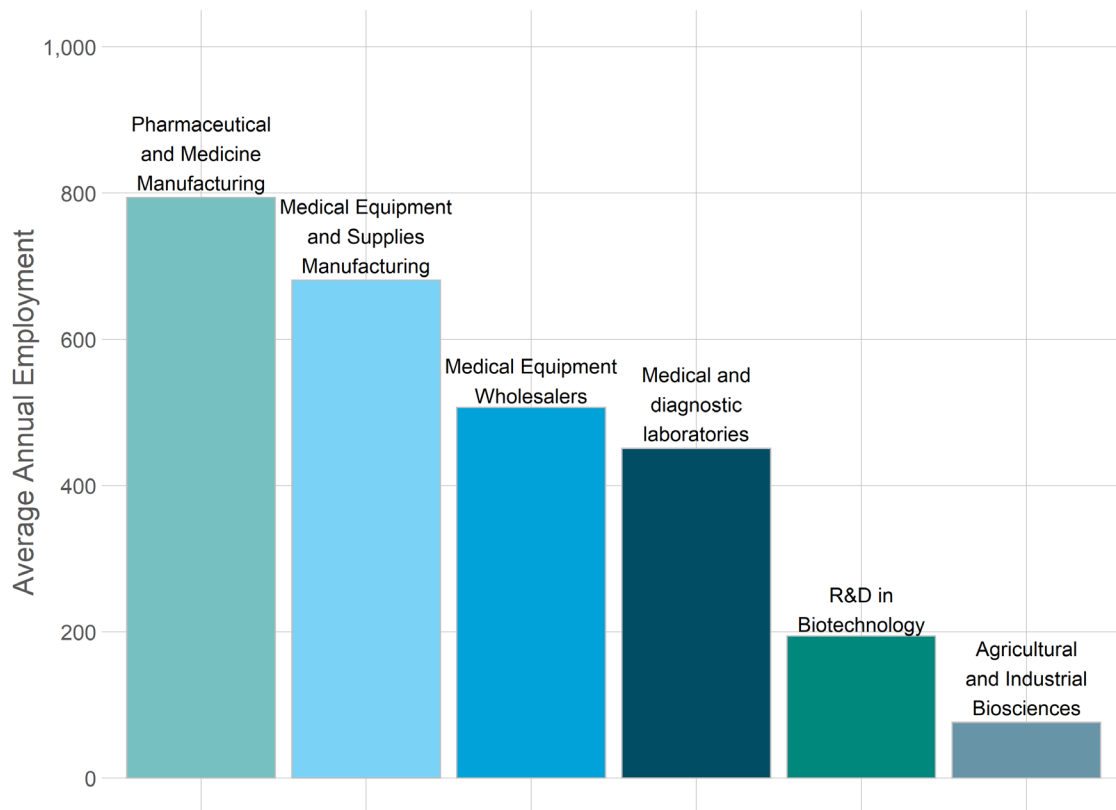
<b>Bioscience Subsector</b>	<b>Examples</b>	<b>NAICS Codes</b>
<b><i>Agricultural and Industrial Bioscience Firms</i></b>	Soybean and other oilseed processing, organic chemical manufacturing, nitrogenous fertilizer manufacturing	311221, 311224, 32519, 3253
<b><i>Pharmaceutical and Medicine Manufacturing</i></b>	Drugs, medicinal, diagnostic substances, vaccines	3254
<b><i>Medical Equipment and Supplies Manufacturing</i></b>	Laboratory, surgical, and dental equipment manufacturing.	334510,334512,334516 3391
<b><i>Research and Development in Biotechnology</i></b>	Protein engineering research, experimental development laboratories	541711 (Before 2017), 541714
<b><i>Medical and diagnostic laboratories</i></b>	Blood analysis laboratories, medical forensic laboratories, Magnetic resonance imaging (MRI) centers	6215
<b><i>Medical Equipment Wholesalers</i></b>	Diagnostic equipment, hospital beds, face shields, first-aid kits merchant wholesalers	423450

Sources: Bureau of Labor Statistics, Montana Dept of Labor and Industry, BBER

## Employment and Wages

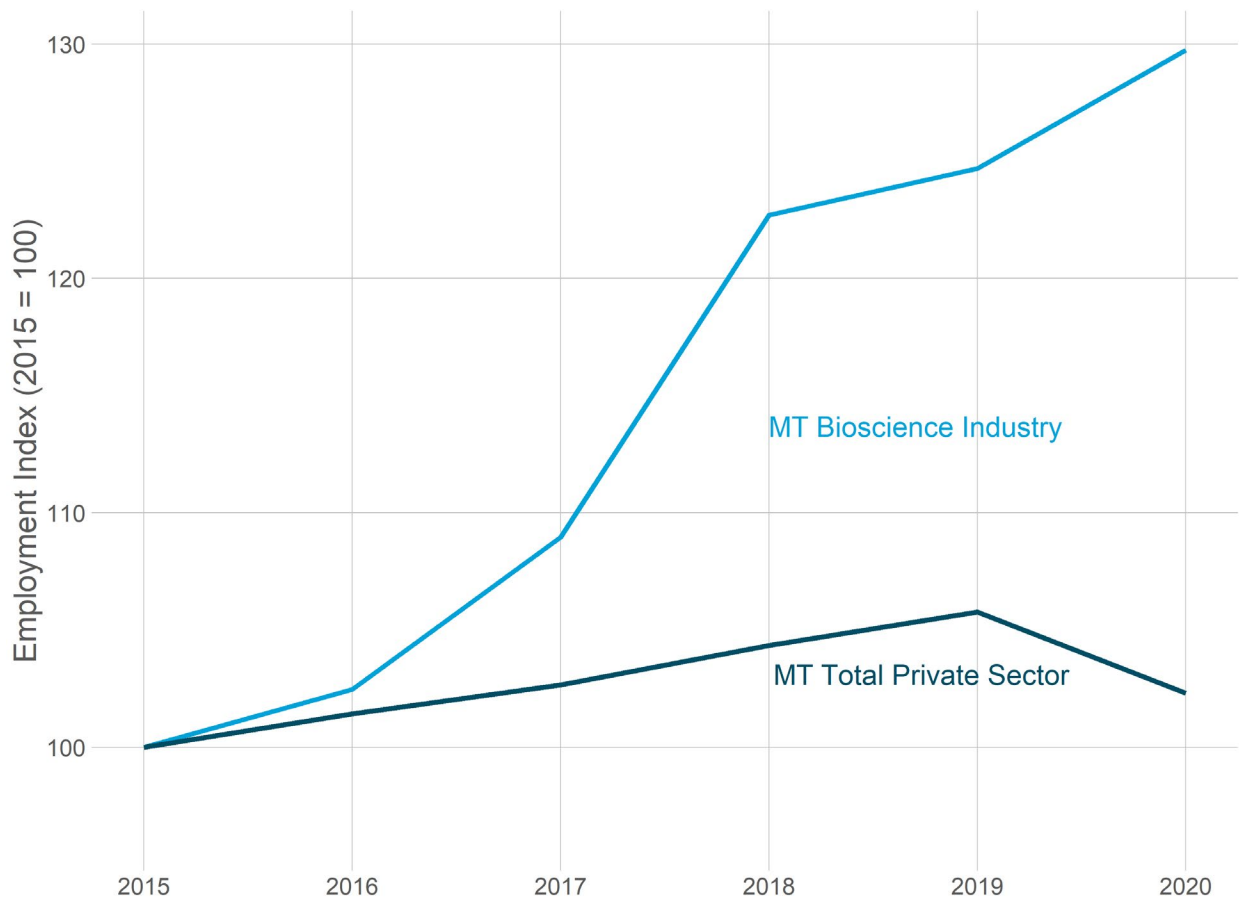
Montana's bioscience industry is a diverse collection of six industries directly supporting 2,701 jobs from 2020 to 2021 within the state. Of this over half of these jobs are employed within the two manufacturing sectors producing pharmaceuticals and medical equipment, shown in the first two bars in Figure 1. The industries help support the substantial medical equipment wholesaling sector in the state. The higher skilled jobs within medical and diagnostic testing and research & development together make up about 24 percent of the jobs within Montana. A steady but small sector in terms of state employment is in agricultural and industrial bioscience.

*Figure 1: Bioscience Employment*



The bioscience industry has grown more quickly than the overall economy. Figure 2 shows just how much faster bioscience employment has grown compared to private sector employment. At the end of 2020, the bioscience industry was about 30 percent larger, whereas overall private sector employment was only about 2.5 percent larger. Moreover, its growth continued throughout 2020 despite the state's overall dip in employment, showing the industry's relative advantage during economic downturns.

Figure 2: Montana employment trends, bioscience industry and private sector, 2014 – 2020

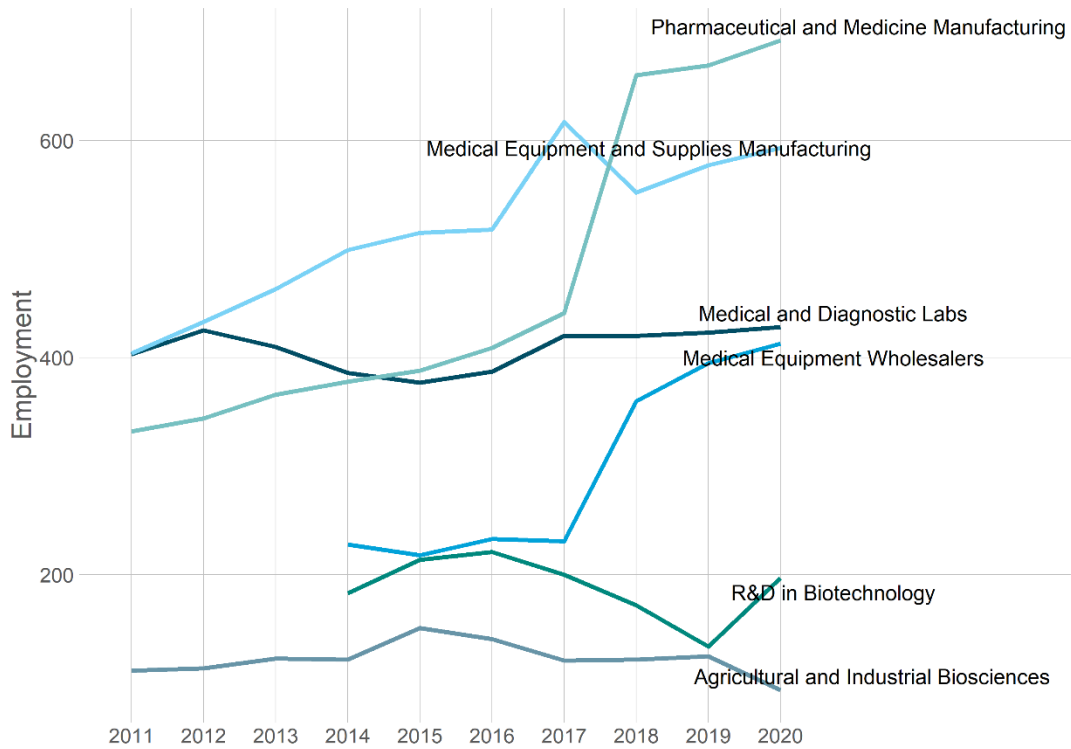


Source: Bureau of Labor Statistics, Montana Department of Labor and Industry, BBER

Within the industry despite being composed of industries serving very different markets all subsectors have shown either stability or growth in employment since 2011. Figure 3 shows agricultural and industrial bioscience consistently employ between 100 and 150 workers. Research and development in biotechnology after almost three years of declining employment made a nearly 50 percent increase in jobs in 2020 exceeding its 2014 average employment.

Figure 3 also makes clear a majority of the growth in the industry occurred in the manufacturing and wholesaling subsectors. Pharmaceutical and medical equipment manufacturing make up a majority of the growth in the bioscience industry. Medical equipment wholesaling – a new addition to NAICS – is becoming an increasingly important sector in the state economy employing about 413 workers throughout 2020.

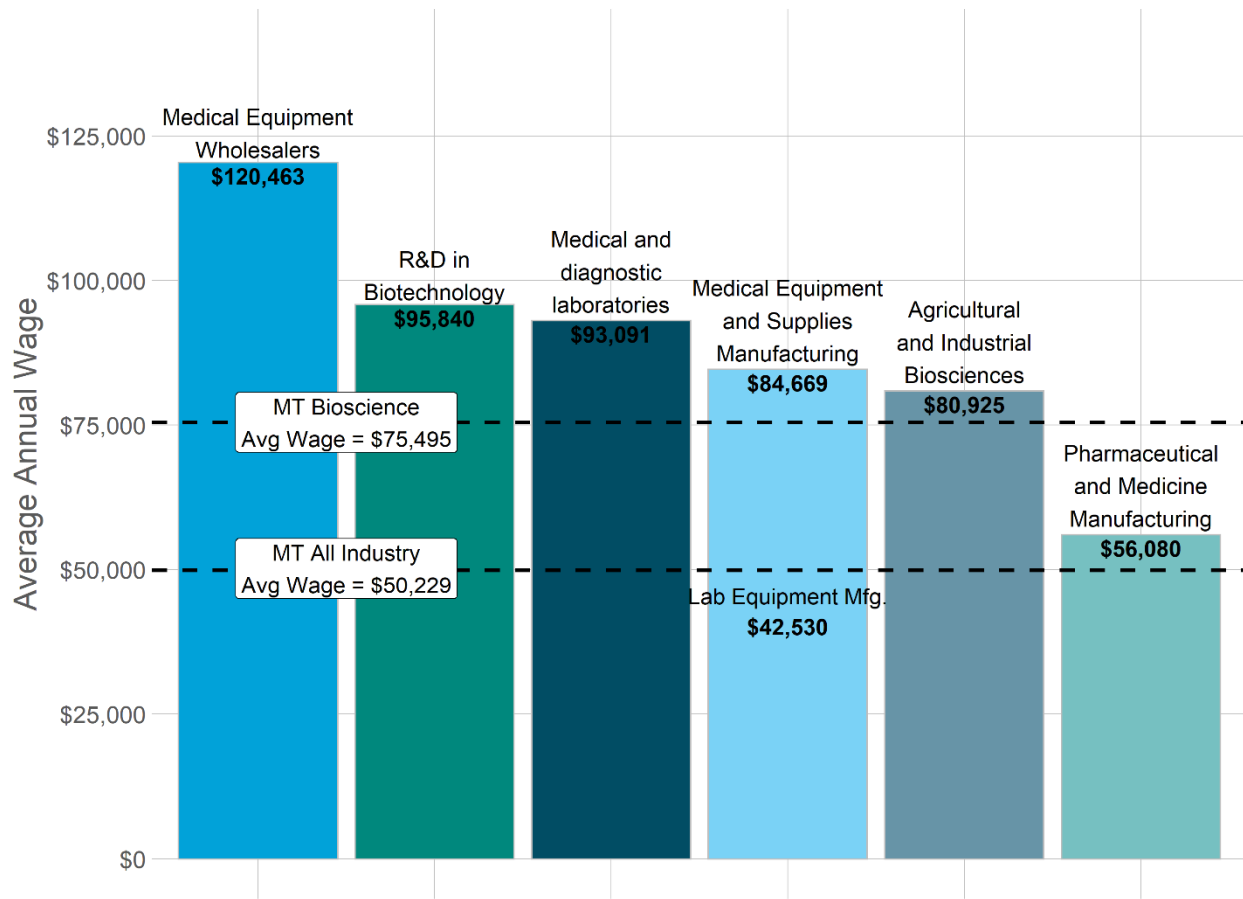
Figure 3: Growth in bioscience employment by subsector, 2011-20



Sources: U.S. Bureau of Labor Statistics, Montana Dept of Labor and Industry, BBER

Not only is bioscience providing an increasing number of jobs over time, but these new jobs are high quality high-paying jobs. Figure 4 shows that all five subsectors within the industry have annual average wages higher than that of all industries in Montana. Overall, bioscience employees in Montana receive about \$75,495 in wages or about \$25,000 more than the state economy average.

Figure 4: Wages by subsector, Montana, 2020-21

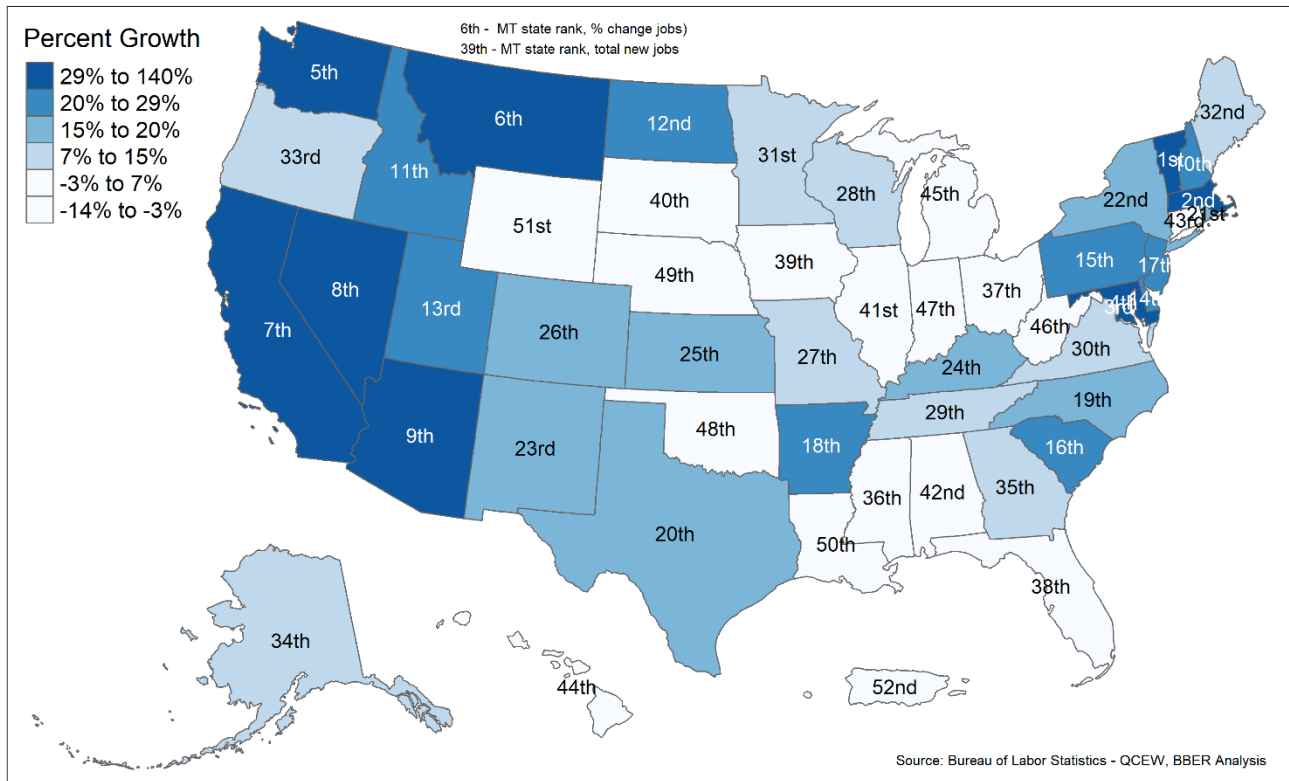


Sources: U.S. Bureau of Labor Statistics, Montana Dept of Labor and Industry, BBER.

### Montana Bioscience Growth vs Nation, State Distribution

Montana bioscience employment is one of the fastest-growing in the country growing more than a third since 2015. In percentage terms this ranks sixth among all 52 U.S. territories in the 2015-20 period, as shown in Figure 5. What is most impressive is this growth ranks Montana among much larger states with active bioscience hubs like Washington and California. If this growth continues Montana may shortly become another regional center of bioscience activity in the west.

Figure 5: State rankings of growth in the bioscience industry, 2015-20



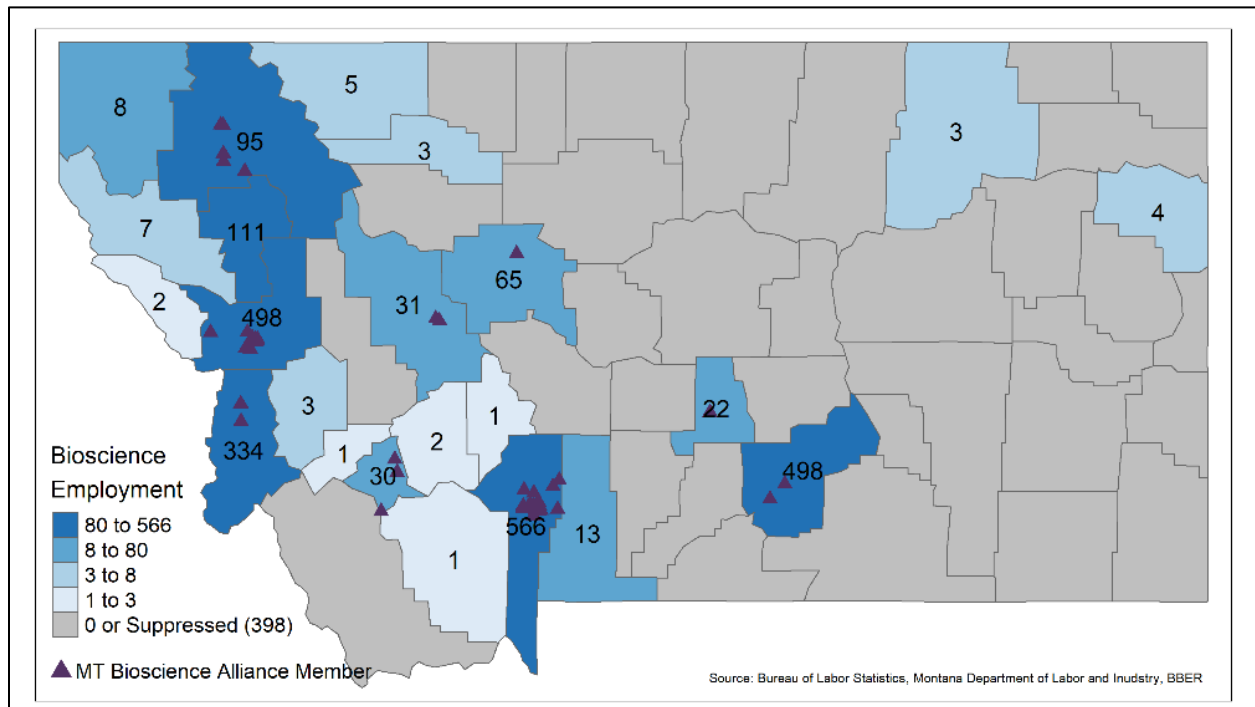
Sources: U.S. Bureau of Labor Statistics, BBER

Most bioscience activity occurs mainly within the western half of Montana as small hubs have formed around the cities of Billings, Bozeman, Hamilton, Kalispell and Missoula. As this industry grows over time, it is expected to see bioscience businesses continue to appear near the dark blue areas mapped in Figure 6.

This industry, while concentrated in Western Montana, has an employment footprint across much of the state. From 2020 to 2021, bioscience employed workers in 23 of the 56 counties in the state, blue counties in Figure 6. Some rural counties such as Golden Valley owe a substantial proportion of non-farm employment to the presence of bioscience.



Figure 6: Average bioscience employment by county 2020-21



Sources: U.S. Bureau of Labor Statistics, Montana Dept of Labor and Industry, BBER

This section presented an assessment of the growth and importance of Montana’s bioscience industry. This portrayed the impressive growth over the past decade, significantly exceeding the employment growth within the Montana economy. Employment growth was also remarkable nationally. Compared to other bioscience industries in the nation, Montana ranks 6<sup>th</sup> in employment growth rates among the much larger states of Washington and California.

We can reasonably expect this industry's economic support to continue for the foreseeable future. Bioscience stands out as an industry that will continue to support growth in the state even while other parts of the economy falter.

The new jobs created by this industry also pay substantially better than the overall state average, contributing to the availability of stable, high-paying jobs throughout much of the state, supporting local and state economies through increased local spending and tax revenues.

The following section builds upon the industry's impressive performance and resilience and estimates the broader contribution of this industry on regional and state economies.

### 3. Bioscience Industry Contributions to the Montana Economy

The impact of the bioscience industry will likely continue to grow along with its economic footprint over time. But also, the presence of the industry creates an economic impact over and above its current footprint through new spending from resident wages, tax payments, sales, and investments that occur as a result of this industry. The following analysis answers the question: how much larger is Montana's economy due to the presence of this industry compared to its absence?

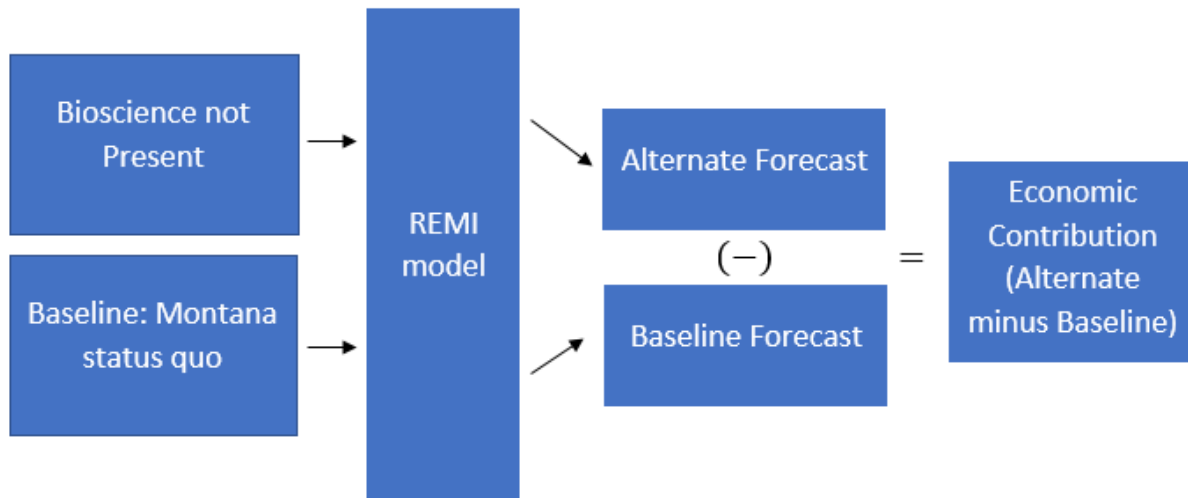
BBER uses an economic model calibrated for the current Montana economy to capture all the interrelated connections between bioscience firms and the rest of the Montana economy. The Regional Economic Model produced by REMI is an industry-leading tool for estimating overall economic contributions from economic activity or policies on regional and state economies. A full explanation of the REMI model's structure is explained in (Treyz, 1993).

Continuing the analysis of employment obtained from the Montana Department of Labor and Industry, we estimate overall economic activity both directly and indirectly related to bioscience in the state. For example, in the absence of 2,701 bioscience jobs in 2021, we would have lower worker spending, lower business demand, and lower revenues currently propagating through the economy. The REMI model captures those propagating linkages to allow comparisons of the actual Montana economy to what would exist if the bioscience industry were absent.

#### The REMI Modeling Methodology

The approach of this research is to find the difference between two scenarios for the Montana economy, the Montana economy if the bioscience industry were not present set against the Montana economy as it is, depicted graphically in Figure 7 below. The economy absent bioscience is explicitly calibrated to extract the true total contribution of the bioscience industry in the state.

Figure 7: Economic impact analysis with the REMI model

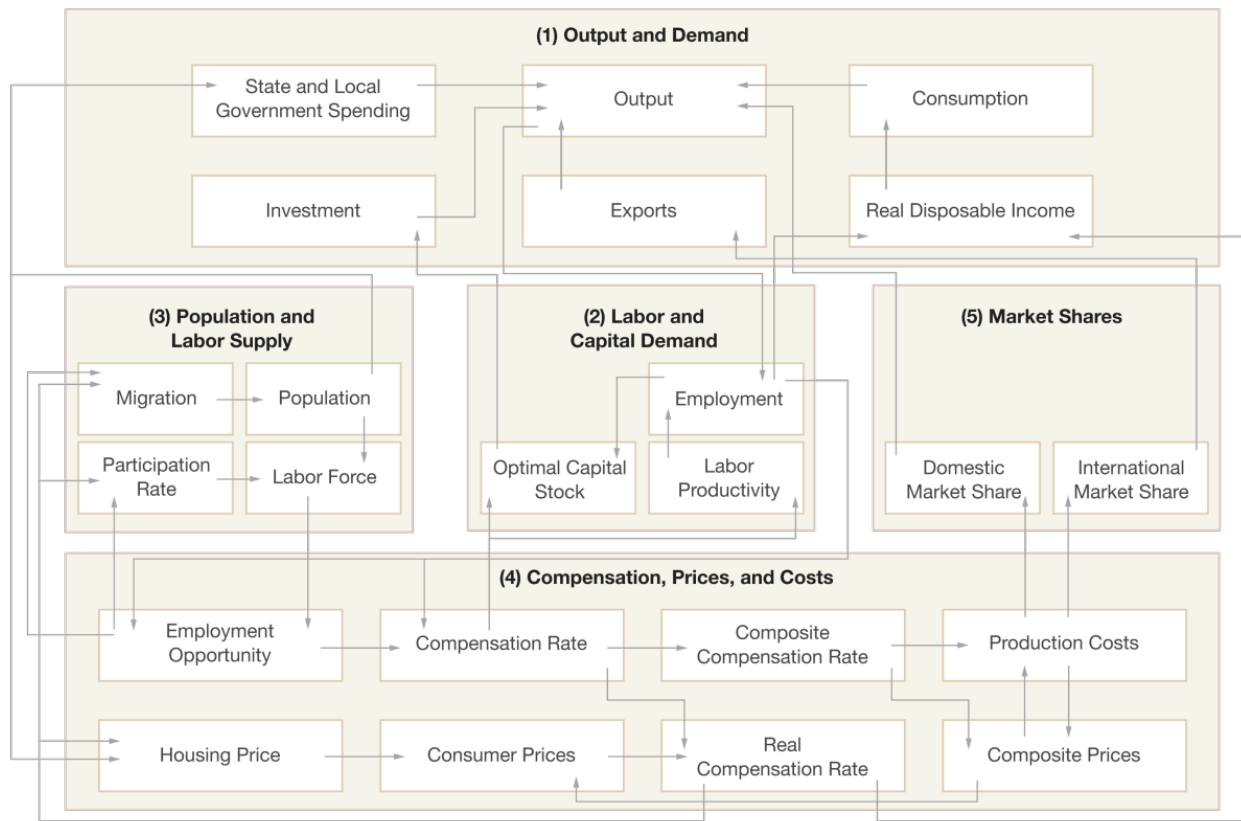


BBER's economic model projects employment, income, total output, and the population that would be present in both scenarios. Since the spending and production of Montana's economy is received as income and inputs by others in the economy, the total impact is larger than the direct impact of the bioscience industry's footprint alone.

The contributions reported here are the difference between these two scenarios for the state economy: the current Montana economy and an alternate economy without the bioscience industry. The economy without bioscience carefully removes the employment and production within the bioscience industry as well as all associated linkages supported by this industry.

The REMI model utilizes historical data on production, prices, trade flows, migration, and technological advances to calibrate the relationship between five basic blocks of the state economy: 1) output and demand; 2) labor and capital demand; 3) population and labor supply; 4) compensation, prices and costs; and 5) market shares, as shown Figure 8.

Figure 8: REMI model linkages



The differences in labor demand, production and intermediate demand associated with the absence of the bioscience industry impact these blocks, causing them to react to the changes and adjust to a new equilibrium. This new equilibrium constitutes the alternative scenario used to compare the two scenarios.

The analysis of the economic impact of the bioscience industry can be conceptually broken down into three separate and distinct components:

- Direct effects: Payroll, vendor purchases, tax payments, and other economic flows that come from the operations of the facility itself.
- Indirect effects: Comprises other economic activities connected to the bioscience industry but are not part of the establishments themselves.
- Induced effects: Direct and indirect spending is received as income by individuals, businesses, and governments within the state, and re-spent in the economy, supporting additional jobs and income streams, such as the retail and restaurant industries, the so-called "multiplier."

## Summary of Bioscience’s Economic Contributions

We find that Montana’s bioscience industry’s impacts significantly exceed those from employment and compensation in the industry alone. This sector of the economy is responsible for a total of 4,729 jobs in the state. This indicates that for every three bioscience employees roughly an additional job is created in the rest of the economy. The sum of all impacts – direct, indirect, and induced – resulting from this industry are summarized in Table 2.

*Table 2: The economic impact of Montana’s bioscience industry: summary*

	<b>Category</b>	<b>Units</b>	<b>Impact</b>
<i>Total Employment</i> .....		Jobs	4,729
<i>Personal Income</i> .....		\$ Millions	450.8
<i>Disposable Personal Income</i> .....		\$ Millions	393.5
<i>Output</i> .....		\$ Millions	918.4
<i>Population</i> .....		People	6,754

*Source: BBER Analysis*

The bioscience industry is responsible for an additional \$393.5 million in personal disposable income paid to Montana residents and \$57.3 million in state and federal income tax revenue. In addition, Montana businesses and organizations receive an additional \$918.4 million in gross receipts and about 6,754 new residents due to the increased attractiveness of living and working in Montana.

## Employment Impacts

Bioscience’s broad range of economic activities propagate through the additional spending of employers and their employees. The addition of a new industry creates new spending locally that would not occur without this industry. It not only adds jobs directly as employers spend portions of their revenue on employees, but also increases spending when the additional recipients of wages, sales, and taxes spend money in the local economy creating jobs in seemingly unconnected areas of the economy.

The impacts of bioscience are most significant for manufacturing. Still, other sectors such as retail trade and construction that are seemingly distant from bioscience also benefit from these jobs, shown in Table 3. For example, workers in bioscience earning relatively high wages demand goods and services in Montana and signal a building response in Montana markets, creating an additional 421 retail jobs and 223 construction jobs in the state economy.

*Table 3: Employment impacts by industry*

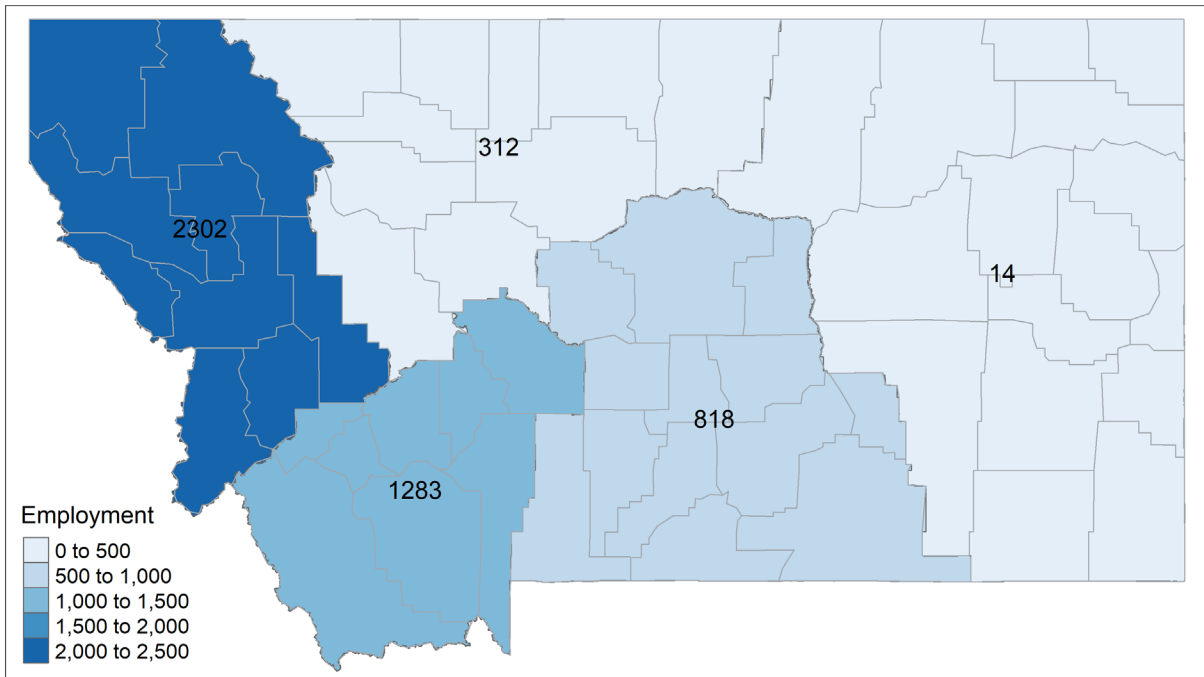
<b>Industry</b>	<b>Impact</b>
<i>Manufacturing.....</i>	1,249
<i>Other Private.....</i>	673
<i>Health Care and Social Assistance.....</i>	615
<i>Government.....</i>	501
<i>Retail Trade.....</i>	421
<i>Accommodation and Food Services.....</i>	326
<i>Professional and Technical Services.....</i>	225
<i>Construction.....</i>	223
<i>Other Services, except Public Administration.....</i>	203
<i>Administrative and Waste Services.....</i>	163
<i>Arts, Entertainment, and Recreation.....</i>	65
<i>Transportation and Warehousing.....</i>	55
<i>Mining.....</i>	9
<i>TOTAL.....</i>	4,729

Source: BBER Analysis



One way to represent how employees impact the broader economy is the fact that impacts are not limited to the county or region in which they occur. For example, most bioscience workers in Montana live in the Northwestern and Southwestern parts of the state, but 1,144 jobs are created outside these areas, summarized by region in Figure 9. These jobs result from trade flows between regions or taxes paid to the state government.

Figure 9: Total employment impacts by region



Source: BBER Analysis

## Compensation Impacts

The industry also contributes to the economy through compensation from these jobs paid to Montana workers, estimated to be over a quarter of a billion dollars, the first row in Table 4. This table represents total compensation from those directly employed in the bioscience industry plus the compensation indirectly supported by the industry.

All income derived from employment is not captured in wages and salaries alone. An additional \$96.4 million is paid in benefits to employees, resulting in total compensation of \$376.2 million. Total earnings are shown on the third row of Table 4 and include income earned by business proprietors and self-employed workers.

*Table 4: Compensation impacts*

<b>Category</b>	<b>Units</b>	<b>Impact</b>
<i>Wages and Salaries.....</i>	\$ Millions	279.8
<i>Compensation.....</i>	\$ Millions	376.2
<i>Earnings.....</i>	\$ Millions	389.6
<i>Earnings per Job, New Jobs.....</i>	\$ Dollars	\$74,480

*Source: BBER Analysis*

On average, the earnings impact of each job supported by the bioscience industry is \$74,480. For comparison, the average earnings per job in Montana overall is \$50,229. Therefore, bioscience in Montana creates overall higher-earning employment supporting higher incomes for Montana workers overall, meaning encouraging growth in this area can raise overall worker compensation in the state.

## Personal Income Impacts

The overall contribution received by Montana households due to the bioscience industry can be measured by the total income these households receive. A detailed outline of the composition of the personal income impacts is detailed in Table 5, providing additional insight into how the bioscience industry makes the state economy larger.

*Table 5: Personal income impacts (millions of dollars)*

	Category	Impact
<i>Total Earnings by Place of Work</i>		389.6
	Total Wage and Salary Disbursements	279.8
<i>Supplements to Wages and Salaries</i>		96.4
	Employer contributions for employee pension and insurance funds	61.2
	Employer contributions for government social insurance	35.2
	Proprietors' income with inventory valuation and capital consumption adjustments	13.4
<i>Less:</i>	Contributions for government social insurance	61.8
	Employee and self-employed contributions for government social insurance	26.5
	Employer contributions for government social insurance	35.2
<i>Plus:</i>	Adjustment for residence	(1.4)
	Gross In	5.1
	Gross Out	6.5
<i>Equals:</i>	Net earnings by place of residence	326.4
<i>Plus:</i>	Property Income	67.4
	Dividends	22.6
	Interest	34.1
	Rent	10.6
<i>Plus:</i>	Personal Current Transfer Receipts	57.0
<i>Equals:</i>	Personal Income	450.8
<i>Less:</i>	Personal Current Taxes	57.3
<i>Equals:</i>	Disposable Personal Income	393.5

Source: BBER Analysis

Total earnings by place of work make up only 86 percent of Montana households' additional income, highlighting that an extra 14 percent originates from sources other than employment alone. Other sources include government transfer payments (Social Security, Medicare) and the income derived from property ownership. These additional sources of income provide a larger picture of how the bioscience industry impacts the economy through more mechanisms than employment alone.

## Summary

This section presented an assessment of some of the bioscience industry's impacts on the Montana economy, based upon the most recent employment and wages data from the U.S. Bureau of Labor Statistics and the Montana Department of Labor and Industry.

Given its consistent growth over the past decade and the high-paying nature of jobs in this industry, we can reasonably expect its economic footprint to continue to grow for the foreseeable future. Bioscience stands out as an industry that will continue to support the local and the broader Montana economy. Bioscience continued to grow in the state while other parts of the economy faltered, all the while providing the preventative and life-supporting activities that improve the quality of life and health of Montanans and the rest of the world.

## 4. The Bioscience Firm Survey

The Montana BioScience Alliance needed information about the operations, current business performance, markets, anticipated future business performance and impediments to faster growth of Montana's bioscience firms. This information will be used by the Alliance to present a rich profile of bioscience firms across the state. In order to collect this information, University of Montana's Bureau of Business and Economic Research (BBER) conducted a survey of Montana bioscience firms. The pages that follow present the findings of the BBER survey.

### Methods

This survey was sponsored by the Montana BioScience Alliance and the Montana Bioscience Cluster Initiative, and was administered by BBER. The survey was conducted in late 2021 and early 2022. Of the 59 eligible businesses asked to participate in this survey, 36 (61%) responded. The response rate for this survey is calculated using the American Association for Public Opinion Research's formula RR1 (AAPOR, 2016).

The data for this survey were collected by administering a questionnaire via the internet to a list of businesses provided by the Montana BioScience Alliance. BBER used Qualtrics survey research software to manage this survey (Qualtrics, 2020). Data were collected using industry standard methods (Dillman, Smyth, & Christian, 2014). The questionnaire invitation was transmitted by email and respondents are asked to click on a hyperlink to access the online questionnaire. The questionnaire was developed by the Alliance in consultation with BBER.

Following receipt of the survey responses, the data were inspected to ensure no duplicate cases were included and to correct any obvious typos made by respondents. Appropriate variable and value labels were added to the data set. Appropriate composite variables and flags, including indicators for industry, were coded and added to the data set to facilitate the analysis process.

BBER conducted a statistical analysis of the survey data using the statistical analysis computer software SPSS (IBM Corporation, 2021). BBER analyzed the data collected using frequencies, cross-tabulations, standard measures of central tendency (mean, median, and mode), sums and ratios (Heeringa, West, & Berglund, 2017).

### Presentation of Survey Findings

This section of report presents the findings of the Montana BioScience Alliance Survey in the order questions appeared in the questionnaire. The exact question language is displayed at the top of each page to provide context necessary for understanding responses. Following the description of the results, this section of the report presents the references that underpin the methods used for the survey.

## Q1. What are your products or services OR planned products and services?

The answers to this question provided by the 36 responding bioscience firms allowed BBER to classify firms into 4 North American Industry Classification System-based categories (Executive Office of the President, Office of Management and Budget, 2017):

1. Pharmaceutical or industrial manufacturing
2. Medical equipment or supply manufacturing
3. Computing and information or warehousing and transportation
4. Research and development or diagnostics.

As Table 6 illustrates, bioscience research and development or diagnostics firms were most likely to respond to the survey (16 firms). Medical equipment or supply manufacturers were the next most likely to respond (12 firms). Pharmaceutical or industrial bioscience manufacturing firms were the third largest group of responding firms (5 firms). The smallest group of responding firms were bioscience computing and information or warehousing and transportation firms (3 firms).

*Table 6: Types of responding bioscience firms*

<b>Bioscience firm type</b>	<b>Number of responding firms</b>	<b>Percent of responding firms</b>
Pharmaceutical or industrial manufacturing	5	14%
Medical equipment or supply manufacturing	12	33%
Computing and information or warehousing and transportation	3	8%
Research and development or diagnostics	16	45%



Q2. How many employees does your company have total?

Q3. How many employees does your company have who live in Montana?

The responding firms employed 488 people in Montana in 2021 (see Table 7). This represents about 32% of the total employment of the responding firms (1,517 employees). The average responding bioscience firm employed 14 Montana workers in 2021. Pharmaceutical or industrial bioscience manufacturing firms employed the most Montanans per firm (33). Medical equipment or supply manufacturing firms employed the most Montanans in total (203). Bioscience computing and information or warehousing and transportation firms are start-ups with few Montana employees so far.

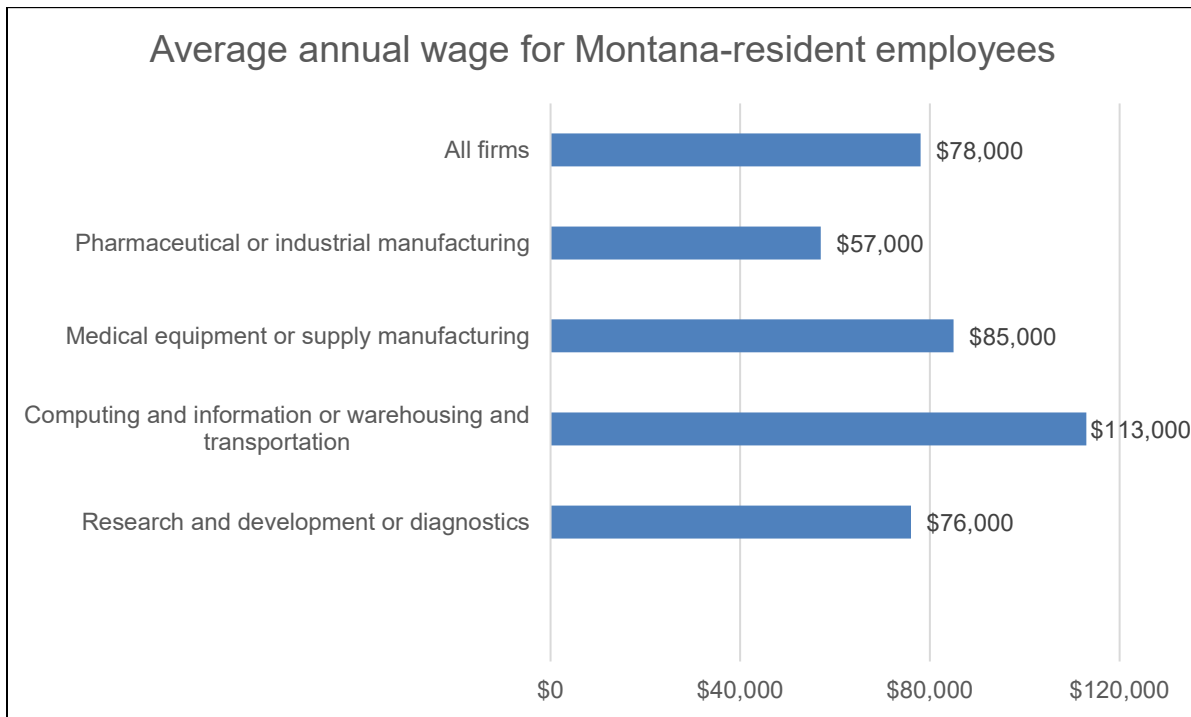
*Table 7: Bioscience firm employment*

Bioscience firm type	Total number of employees		Number of Montana-resident employees	
	Mean per firm	Total in firms	Mean per firm	Total in firms
All responding firms	42	1,517	14	488
Pharmaceutical or industrial manufacturing	35	175	33	167
Medical equipment or supply manufacturing	59	710	17	203
Computing and information or warehousing and transportation	4	11	3	8
Research and development or diagnostics	39	621	7	110

#### Q4. What is your company's average annual wage for employees who live in Montana?

The Montana-resident employees of the responding firms made an average of \$78,000 in 2021. This amount is significantly higher than the average annual wage for Montana workers which was \$50,229 as of the 2<sup>nd</sup> quarter of 2021 (Montana Department of Labor and Industry, University of Montana Bureau of Business and Economic Research, 2021). Figure 10 below illustrates the average wages earned by Montana bioscience firm employees. The highest average annual wages were paid to employees of medical equipment or supply manufacturing firms (\$85,000). Employees of research and development or diagnostic firms ranked 2<sup>nd</sup> (\$76,000). Pharmaceutical or bioscience industrial manufacturing employees annual wages ranked 3<sup>rd</sup> (\$57,000). The few employees of the new, bioscience computing and information or warehousing and transportation firms were paid relatively well, averaging \$113,000 in 2021.

Figure 10: Average annual wage, 2021



Q5. What were your company's annual revenues in 2021?

The responding bioscience firms earned an average of \$2,622,000 per firm in 2021 (see Table 8 below). The combined revenue of these firms in 2021 was \$83,889,000.

*Table 8: Annual revenue, 2021*

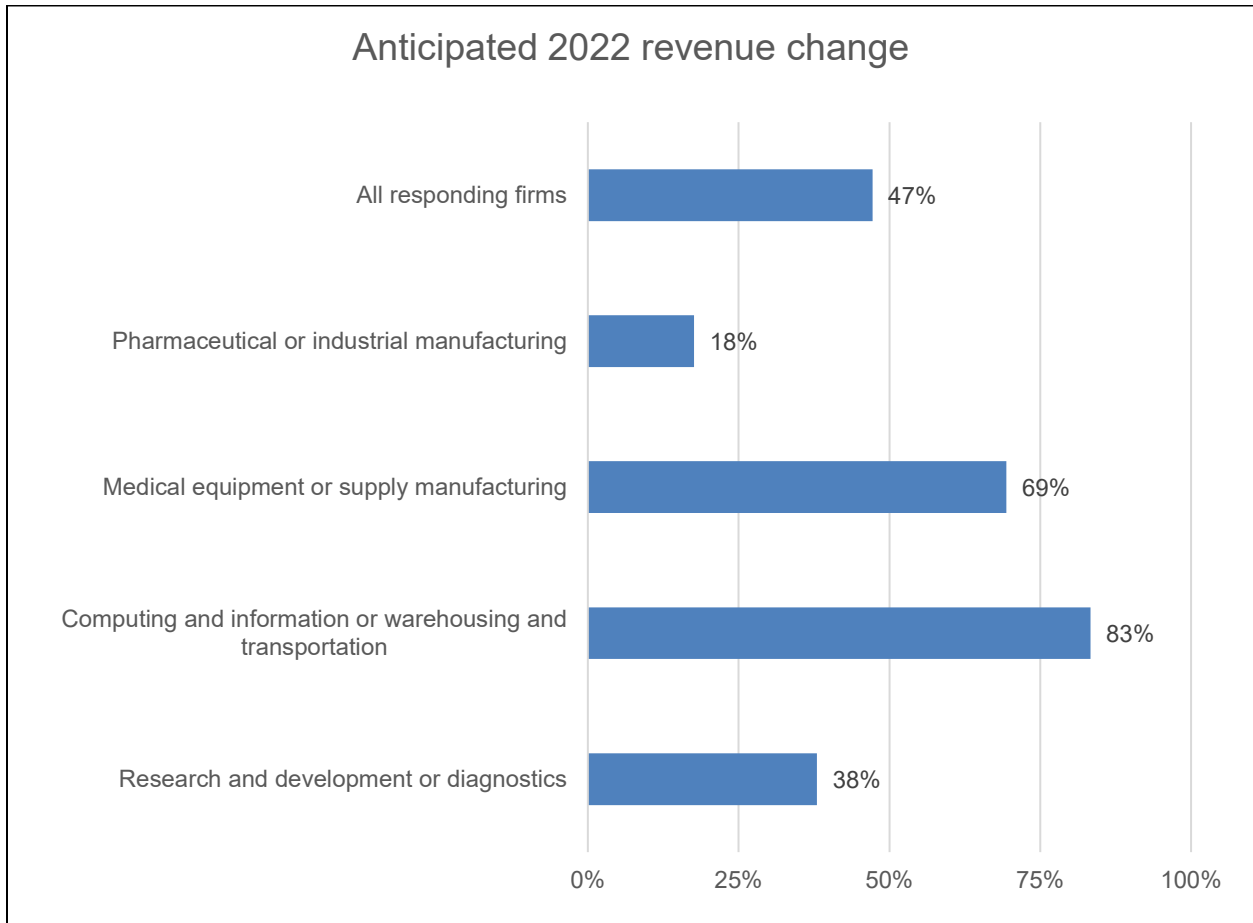
Bioscience firm type	Annual 2021 revenue	
	Mean per firm	Total in firms
All responding firms	\$2,622,000	\$83,889,000
Pharmaceutical or industrial manufacturing	\$3,469,000	\$13,874,000
Medical equipment or supply manufacturing	\$6,039,000	\$54,350,000
Computing and information or warehousing and transportation	\$30,000	\$90,000
Research and development or diagnostics	\$973,000	\$15,575,000

Medical equipment or supply manufacturing firms earned the most revenue in 2021 per firm (\$6,039,000). The start-up, bioscience computing and information or warehousing and transportation, firms earned very little in 2021 (\$30,000 per firm).

Q6. By what percentage do you estimate your company's annual revenues may increase or decrease next year (2022)?

The responding firms anticipate a large increase in earnings in 2022, 47% on average per firm (see Figure 11). While the start-up, bioscience computing and information or warehousing and transportation firms anticipate the largest revenue increase in percentage terms (83%), this starts from a small base as Figure 11 demonstrates.

Figure 11: Anticipated revenue change, 2022



Medical equipment or supply manufacturing firms anticipate a robust 69% increase in revenue in 2022, while research and development or diagnostics firms anticipate a 38% increase and pharmaceutical or industrial manufacturing anticipate an 18% increase.

## Q7. What percent of your market is...?

Most responding bioscience firms (63%) sell their products or services to a national market. Table 9 describes the distribution of responding bioscience firms' markets by the location of the market.

*Table 9: Market distribution by location*

<b>Bioscience firm type</b>	<b>Local</b>	<b>National</b>	<b>International</b>
All responding firms	15%	63%	22%
Pharmaceutical or industrial manufacturing	0%	79%	21%
Medical equipment or supply manufacturing	0%	60%	40%
Computing and information or warehousing and transportation	0%	93%	7%
Research and development or diagnostics	31%	54%	15%

Just over one in five responding bioscience firms (22%) sell products or services to an international market. While 15% of all responding firms sell to a local market, all of the firms that sell to a local market are research and development or diagnostics firms. Medical equipment or supply manufacturing firms (40%) are most likely to sell to an international market. The start-up, bioscience computing and information or warehousing and transportation firms (93%) are overwhelmingly focused on selling to a national market.

Q8. About how many new jobs do you expect your company will create among people who live in Montana next year (2022)?

Responding bioscience firms anticipate adding 149 Montana jobs in 2022 (see Table 10). This represents a nearly 31% increase in Montana employment over 2021.

*Table 10: Anticipated employment growth, 2022*

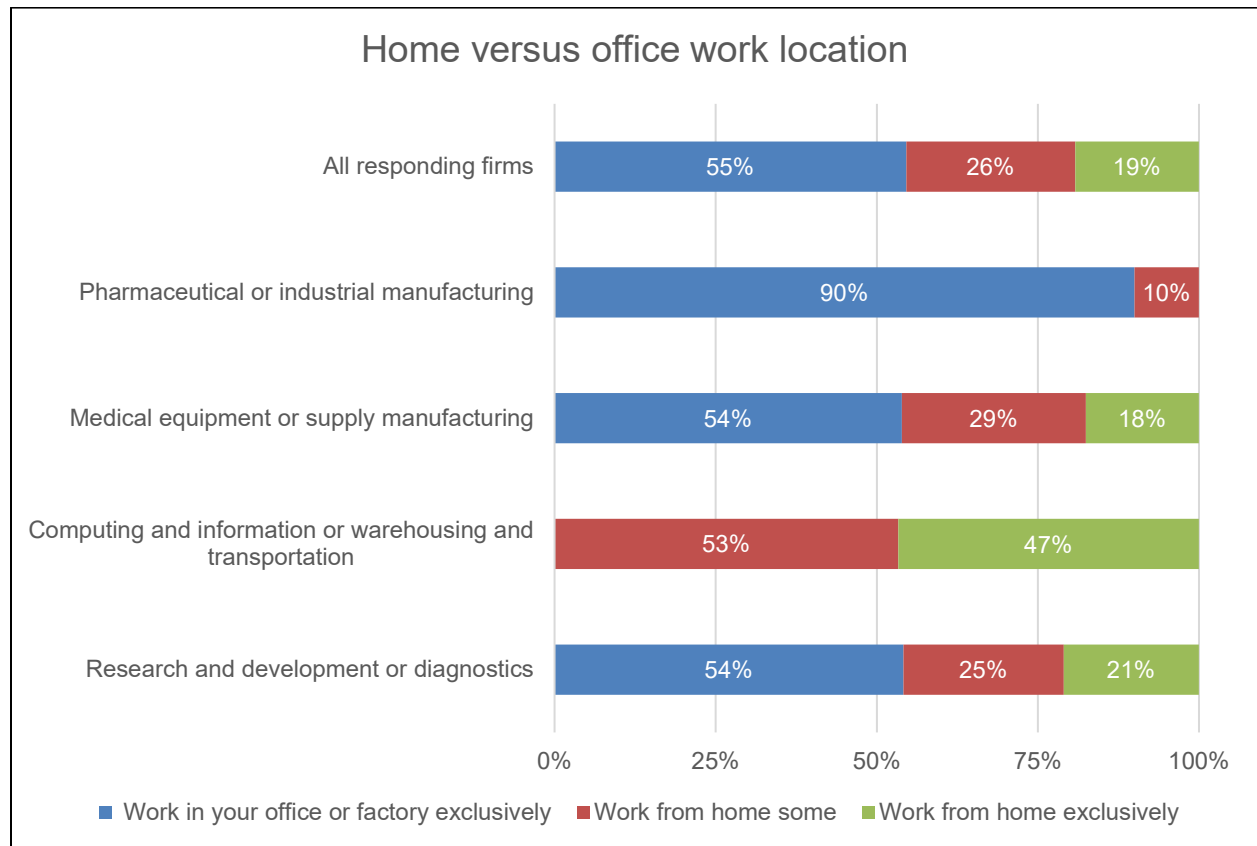
Bioscience firm type	Number of new jobs in 2022	
	Mean per firm	Total in firms
All responding firms	4	149
Pharmaceutical or industrial manufacturing	8	42
Medical equipment or supply manufacturing	6	68
Computing and information or warehousing and transportation	2	6
Research and development or diagnostics	2	33

Pharmaceutical or industrial manufacturing firms plan on adding the most Montana jobs per firm (8). Medical equipment or supply manufacturing firms say they will add 6 jobs per firm on average in 2022. The remaining firms will add about 2 jobs per firm in 2022.

### Q9. What percentage of your employees ...?

At the time this survey was conducted about 45% of the employees of the responding bioscience firms worked from home at least some of the time. This proportion is identical to the national proportion of employees who worked from home at least some of the time (Saad & Wigert, 2021). Approximately 55% of the employees of responding firms worked exclusively in the office, lab or factory. Figure 12 below illustrates the distribution of bioscience firm employees between home and office work locations.

Figure 12: Home versus office work location as of January 2022

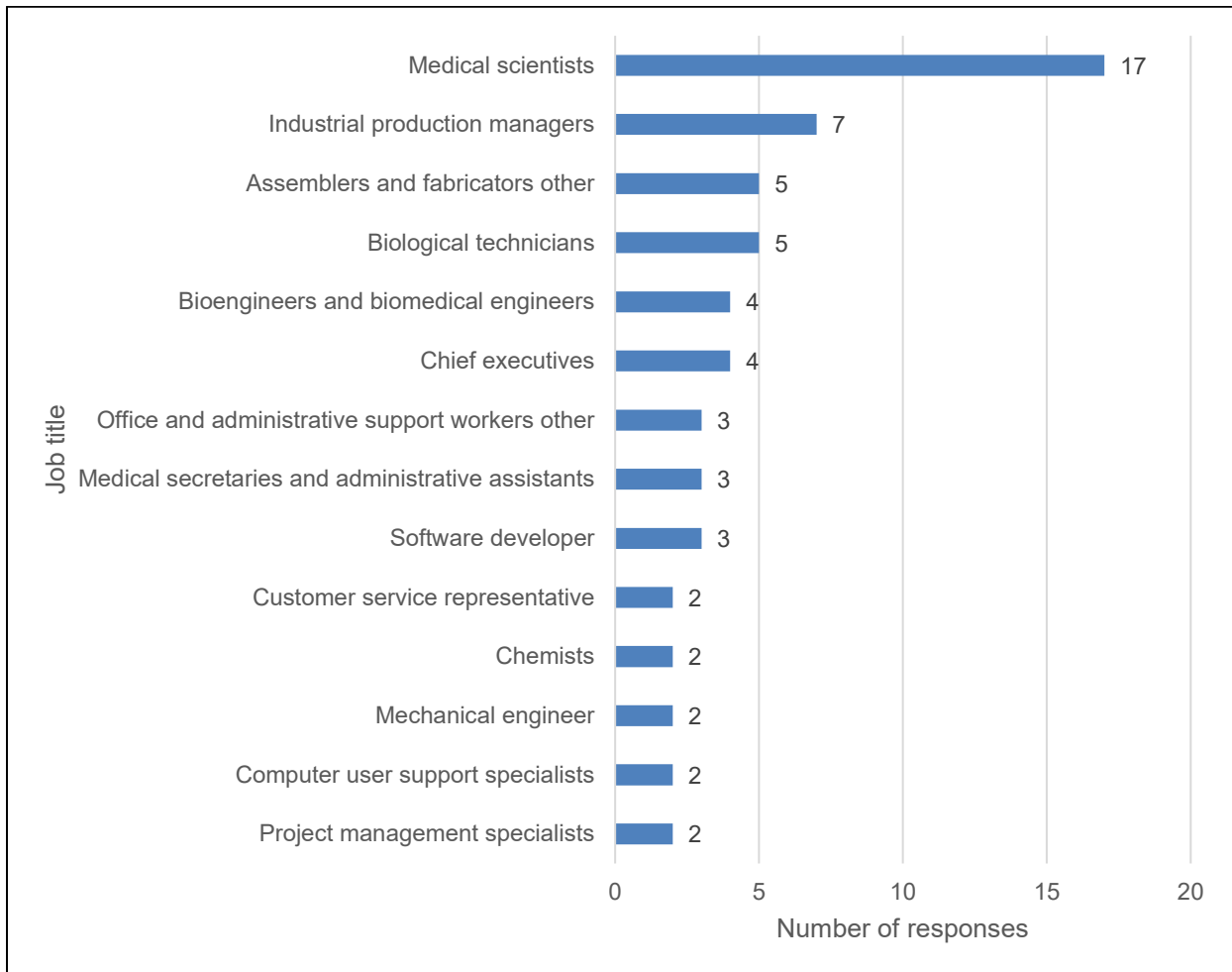


Nine in ten pharmaceutical or industrial manufacturing firm employees (90%) worked exclusively in the office or factory. In contrast, none of the employees of the start-up, bioscience computing and information or warehousing and transportation firms worked exclusively in the office or factory. Just over half of the employees of the remaining bioscience firms (54%) worked exclusively in the office or factory, while 46% worked from home at least some of the time.

Q10. What are the job titles of the three job types that your firm most often hires?

Responding bioscience firms most frequently hire medical scientists (17 responding firms). BBER assigned question 10 responses to Standard Occupational Classifications for clarity (U.S. Bureau of Labor Statistics, 2022). Figure 13 below lists the occupations that responding bioscience firms most frequently hire.

Figure 13: Most often hired occupations



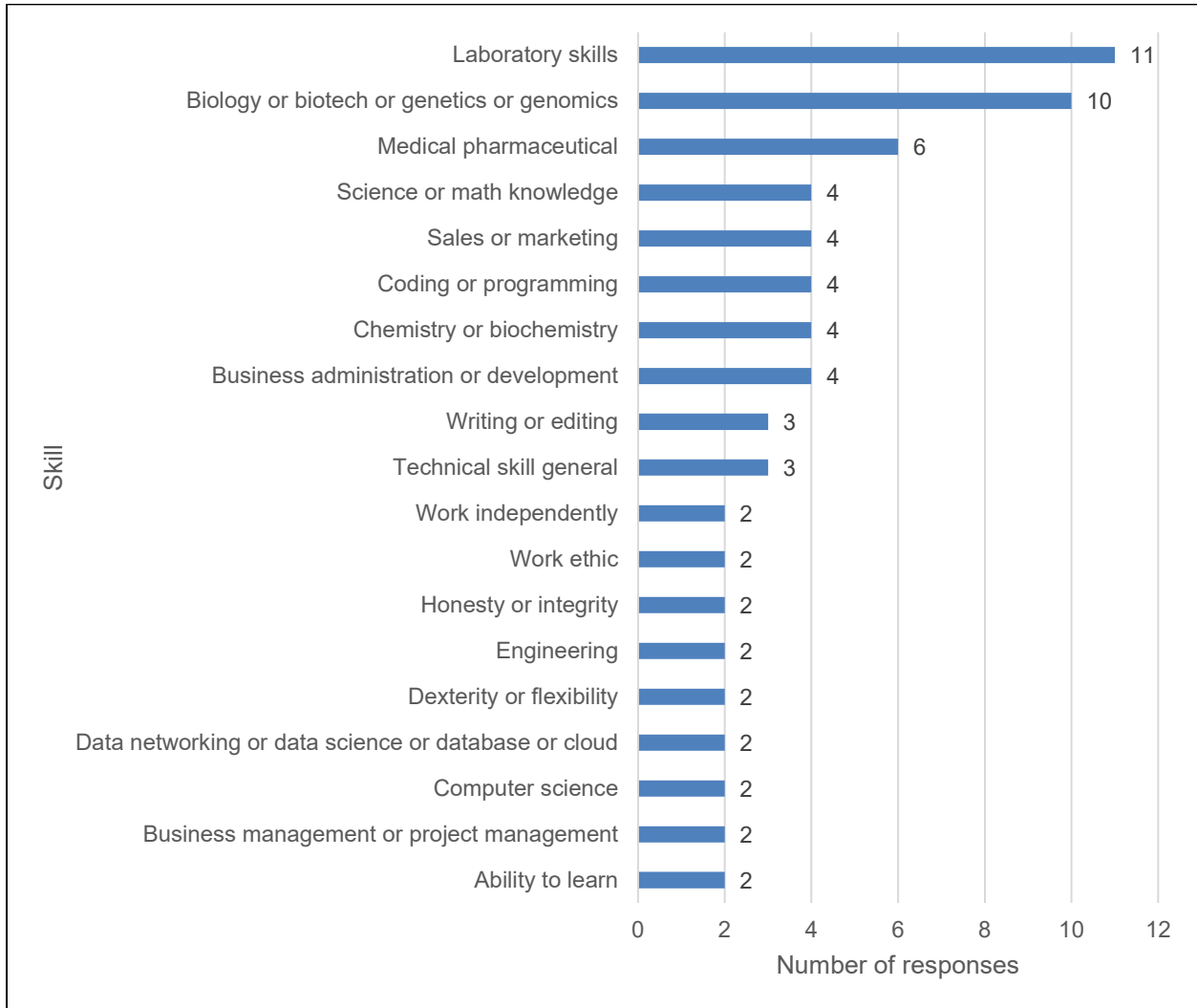
Industrial production managers were the 2<sup>nd</sup> most frequently cited occupation, mentioned by 7 firms. Assemblers and fabricators and biological technicians were both cited by 5 firms as occupations they most often hire.



Q11. What are the three job-related skills your firm looks for most in new hires?

Laboratory skills were cited most frequently by bioscience firms (11 responding firms) as the most sought after skill in new hires. Figure 14 lists the most sought after skills in bioscience firm new hires.

Figure 14: Most sought after skill in new hires

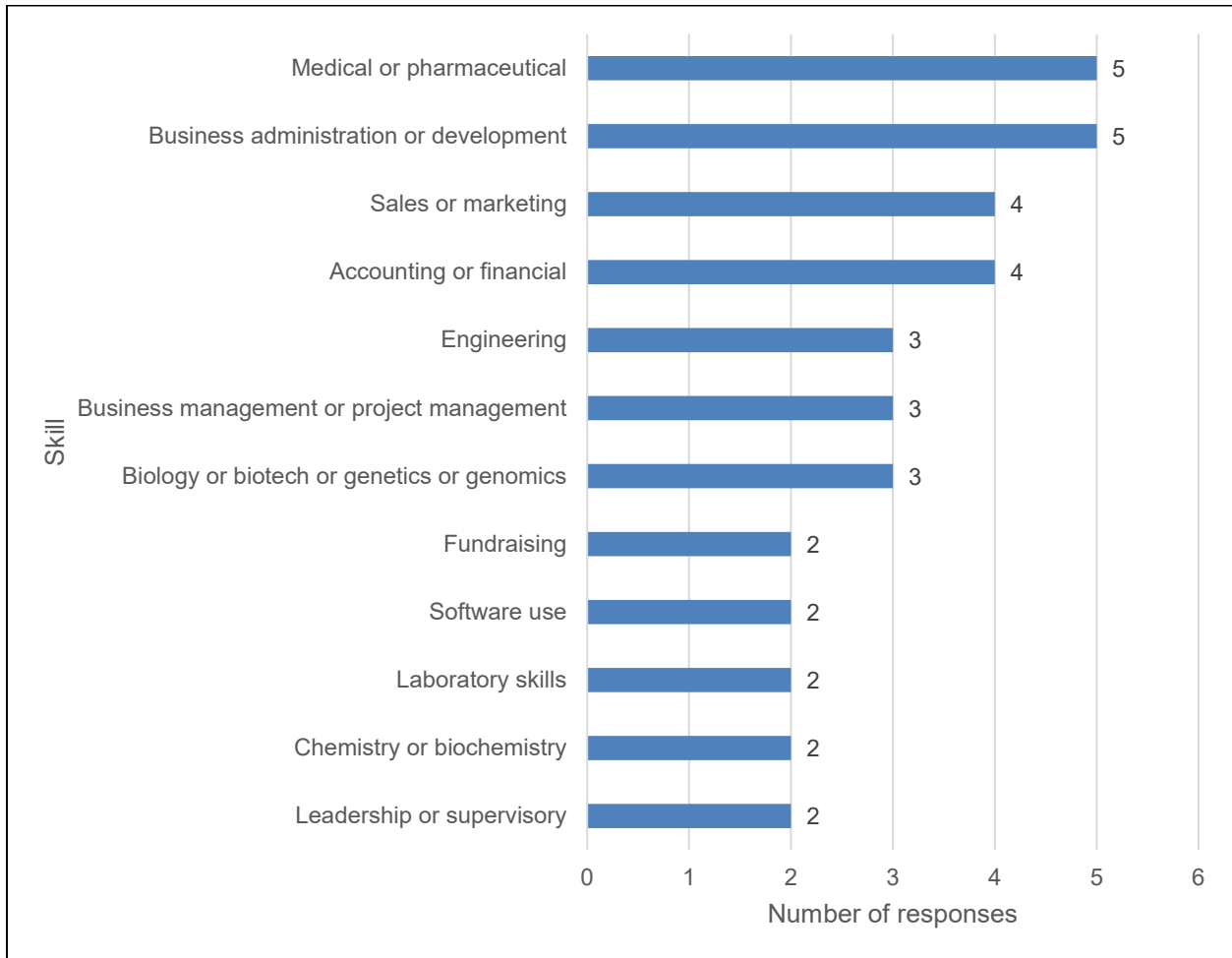


Biology or biotech or genetics or genomics combined were cited by 10 bioscience firms. Medical or pharmaceutical skills were mentioned by 6 firms as the skills they most often seek in new hires.

Q12. Thinking now about your existing workforce, what are the three job-related skills that you would like to add to, or improve, in your current workforce?

Bioscience firms most often cited the need to improve the medical or pharmaceutical (5 responding firms) or the business administration (5 responding firms) skills of their existing workforce. Figure 15 presents the skill improvements most needed by the current bioscience workforce of the responding firms.

Figure 15: Skill improvement most needed in current workforce



Sales or marketing skill improvements were mentioned by 4 firms, as were accounting or financial skill improvements.

Q13. Some Montana employers say that it is hard for their firm to find qualified new employees. Other Montana employers say that it isn't hard for their firm. Over the course of calendar year 2021 would you say that for your firm it has become?

Almost 3 in 10 responding bioscience firms (27%) said it became harder to hire qualified new employees over the last year (see Table 11 below). Only 6% of firms said it became easier to hire new employees over the last year.

*Table 11: Ability to hire new employees over the last year*

<b>Bioscience firm type</b>	<b>Easier to hire qualified new employees</b>	<b>There has been no change in my firm's ability to hire qualified new employees</b>	<b>Harder to hire qualified new employees</b>
All responding firms	6%	67%	27%
Pharmaceutical or industrial manufacturing	20%	20%	60%
Medical equipment or supply manufacturing	0%	78%	22%
Computing and information or warehousing and transportation	0%	67%	33%
Research and development or diagnostics	6%	75%	19%

Sixty percent of pharmaceutical or industrial bioscience manufacturing firms reported that it became harder to hire qualified new employees over the last year. No (0) medical equipment or supply manufacturing firms or computing and information or warehousing and transportation firms said it became easier to hire new employees over the last year.

Q14. Over the course of calendar year 2021 what percentage of your firm's new hires came from people who live in Montana and what percentage came from out of state?

Twenty responding firms reported new employee hires in 2021, while 14 responding firms reported no new employee hires in 2021 and 2 firms did not answer question 14. Of the 20 firms that reported new hires in 2021, 71% of their new hires came from people who live in Montana (see Table 12).

*Table 12: In-state hiring in 2021*

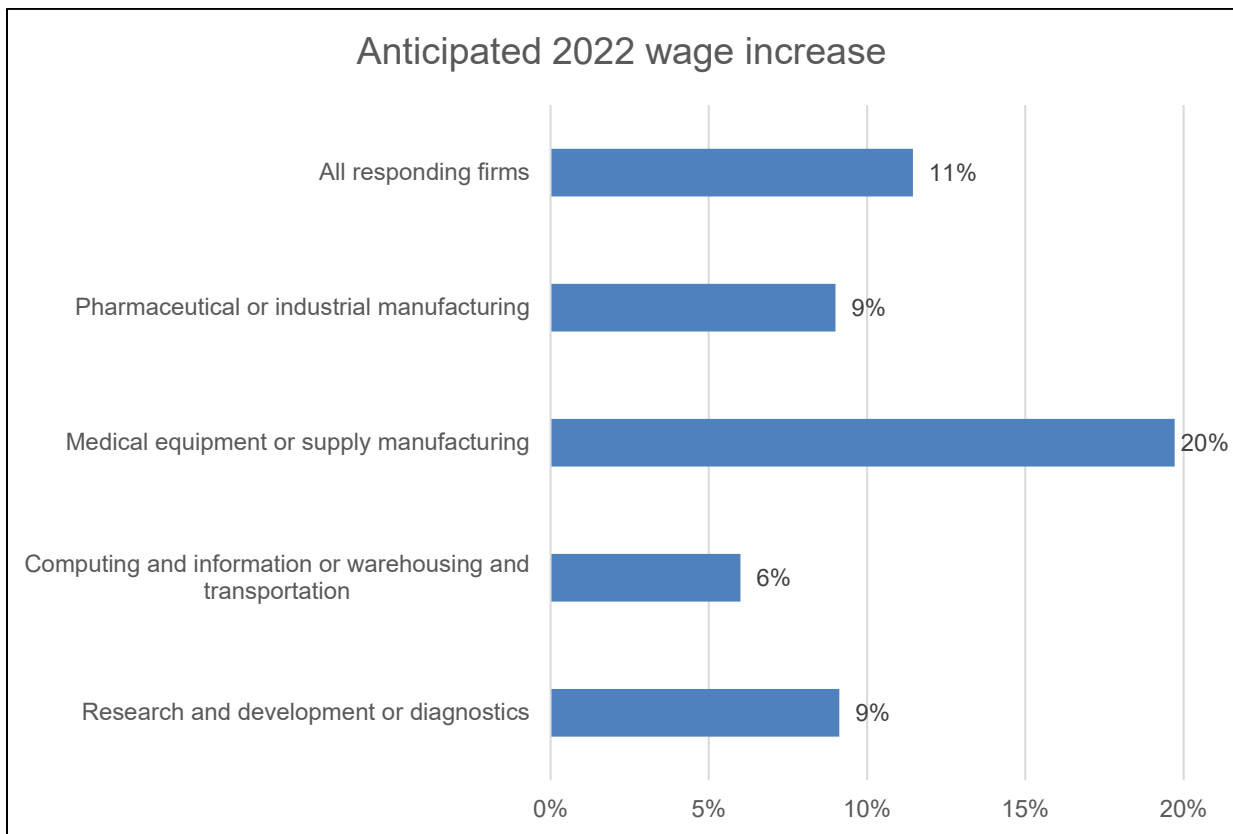
<b>Bioscience firm type</b>	<b>% of new hires who came from people who live in Montana</b>	<b>% of new hires who came from out of state</b>
All firms with new hires in 2021	71%	29%
Pharmaceutical or industrial manufacturing	82%	18%
Medical equipment or supply manufacturing	85%	15%
Computing and information or warehousing and transportation	100%	0%
Research and development or diagnostics	52%	48%

Research and development or diagnostics firms hired significantly more workers from out-of-state (48%) when compared with other responding bioscience firms. The bioscience manufacturing firms sourced more than 8 in 10 of their new hires within Montana. The start-up, bioscience computing and information or warehousing and transportation firms obtained all of their new hires from within Montana.

Q15. By what percentage do you estimate your company's annual wages among people who live in Montana will increase or decrease next year (2022)?

Responding bioscience firms anticipate increasing annual wages for employees in 2022 by an average of 11%. Figure 16 presents the average annual increase anticipated in 2022 by type of bioscience firm. Readers should note that when one start-up firm that anticipated a 100% increase in wages in 2022 is excluded from the analysis, the average anticipated increase for all responding firms drops to 8%.

Figure 16: Anticipated wage increase, 2022



Medical equipment or supply manufacturing firms reported the highest anticipated increase (20%). However, this figure was influenced by one start-up firm that anticipated a 100% increase in wages in 2022. When this response is excluded from the analysis, medical equipment or supply manufacturing firms anticipated a 6% increase in annual wages in 2022. Pharmaceutical or industrial manufacturing firms and research and development or diagnostics firms both anticipate an average 2022 annual increase of 9%.

Q16. About how much money do you anticipate your company will invest in major capital expenditures in Montana next year (2022)?

Responding bioscience firms anticipate spending a total of \$4,346,000 in major capital expenditures in Montana in 2022 (see Table 13 below). The average anticipated expenditure in 2022 per firm is \$145,000.

*Table 13: Anticipated major capital expenditures in Montana, 2022*

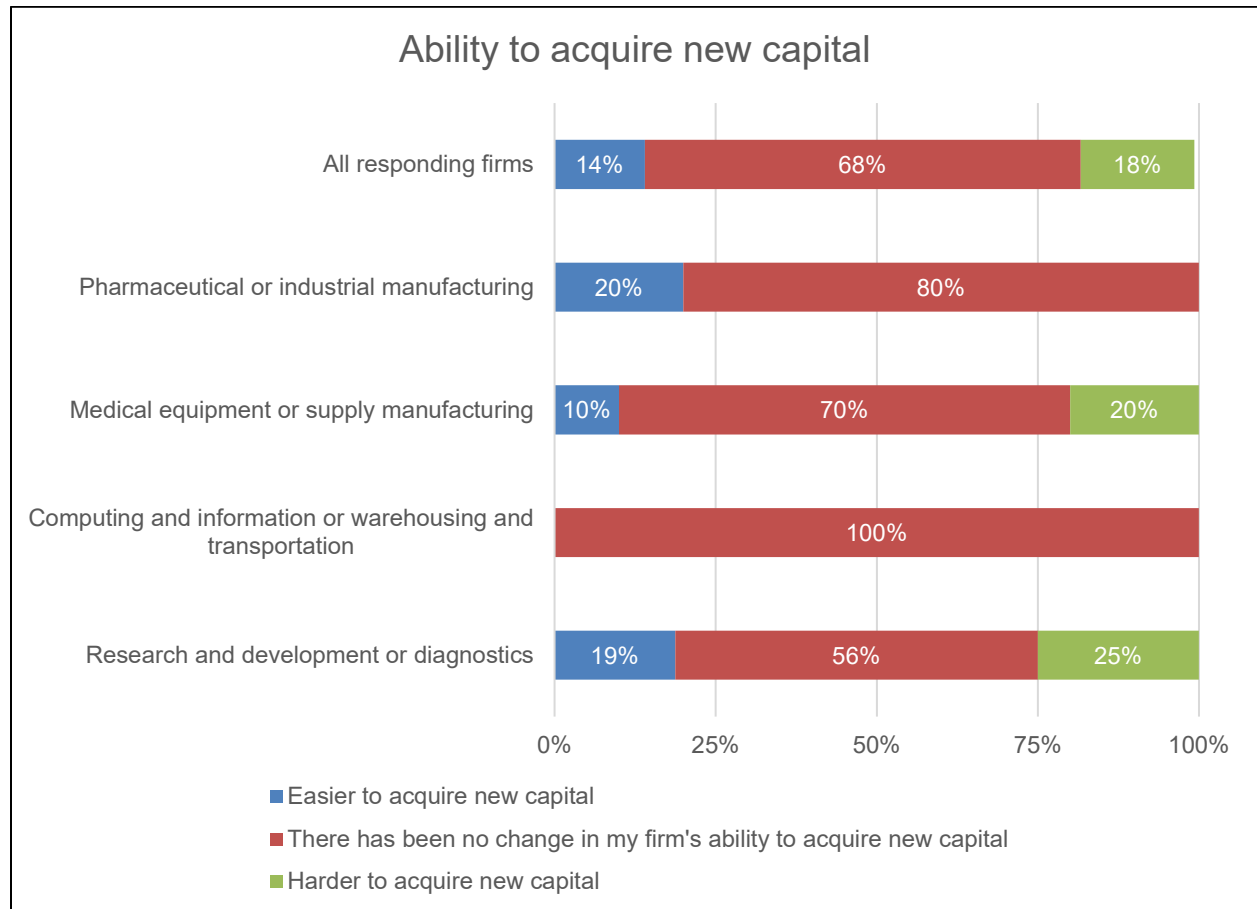
Bioscience firm type	Major capital expenditures in Montana next year - 2022	
	Mean per firm	Total in firms
All responding firms	\$145,000	\$4,346,000
Pharmaceutical or industrial manufacturing	\$370,000	\$1,850,000
Medical equipment or supply manufacturing	\$210,000	\$1,260,000
Computing and information or warehousing and transportation	\$87,000	\$260,000
Research and development or diagnostics	\$61,000	\$976,000

Pharmaceutical or industrial manufacturing firms plan on making the largest expenditures - \$370,000 per firm. Research and development or diagnostics firms will make the smallest expenditures - \$61,000 per firm.

Q17. Some Montana employers say that it is hard for their firm to acquire new capital. Other Montana employers say that it isn't hard for their firm. Over the course of calendar year 2021 would you say that for your firm it has become [chose one] ?

More than two-thirds (68%) of responding bioscience firms said there was no change in their firm's ability to obtain new capital in 2021. Figure 17 displays the distribution of reports from bioscience firms on their ability to acquire new capital in 2021.

Figure 17: Ability to acquire new capital, 2021



One-quarter (25%) of research and development or diagnostics firms reported that it became harder to obtain new capital in 2021. Similarly, 20% of medical equipment or supply manufacturing firms said that it became harder to obtain new capital in 2021. In contrast, no (0%) pharmaceutical or industrial manufacturing firms said that it became harder to obtain new capital in 2021, and 20% of those firms actually reported that it became easier to obtain new capital in 2021.

Q18. What advantage does Montana give you in business?

Responding bioscience firms overwhelmingly (18 firms) cited Montana's quality of life as something that gives their firm an advantage in business. Table 14 lists the advantages mentioned by responding firms.

*Table 14: Advantage Montana gives their firm in business*

<b>Montana advantage</b>	<b>Number of responses</b>
Quality of life in general or a great place to live	18
None or negative comment or disadvantage mentioned	6
Montana's reputation outside the state	4
Workforce quality or work ethic of Montanans	3
Access to educational institutions	1
Favorable taxes	1
Regulations low	1
Fewer COVID-caused problems in Montana	1

The next most often cited advantage (4 firms) is Montana's reputation outside the state. The 3<sup>rd</sup> most often cited advantage (3 firms) is the quality of Montana's workforce.



## Q19. What is your largest impediment to faster growth?

Representatives of 7 bioscience firms said that access to capital is their firm's largest impediment to faster growth (see Table 15).

*Table 15: Firm's largest impediment to faster growth*

<b>Largest impediment to faster growth</b>	<b>Number of responses</b>
Capital access	7
Real estate cost or availability	5
Market conditions or competition	4
Hiring ability not attributed worker quality	3
Internal issue or specific to company	2
Quality new hire availability	2
Transport delays	2
Internet or infrastructure	1
New customers needed or visibility or marketing	1
Regulations	1

Real estate cost or availability was the 2<sup>nd</sup> most frequently mentioned (5 firms) impediment to growth. Respondents mentioned hiring ability as a growth impediment in two different ways: 3 firms mentioned hiring ability generally and 2 firms mentioned the ability to hire quality workers. Combined, these responses would be tied for the 2<sup>nd</sup> ranked growth impediment.

## Q20. What is your most pressing business issue at the moment?

Responding bioscience firms most often cite (9 firms) business development or market development as their firm's most pressing business issue. Table 16 presents the list of bioscience firms' most pressing business issues.

*Table 16: Firm's most pressing business issue*

<b>Firm's most pressing business issue</b>	<b>Number of responses</b>
Business or market development	9
Access to capital	5
Experienced or specialized employee recruitment	4
Obtaining strategic partners	4
Clinical trial assistance or support	2
Intellectual property management	2
Supply chain issues	2
Access to specialized scientific or engineering expertise	1
Administrative assistance	1
Distribution and logistics	1
Using or maximizing impact of social media	1

Access to capital was mentioned by 5 firms as their most pressing business issue. Recruiting experienced or specialized employees and obtaining strategic partners were cited by 4 firms as their most pressing business issue.

Q21. If you are a member, what is the one most important thing you would like to get out of your Montana BioScience Alliance membership?

Most responding bioscience firms (8 firms) want to obtain new clients, new business opportunities or new collaborations as a result of their membership in the Montana BioScience Alliance. Table 17 presents the list of most important Montana BioScience Alliance membership benefits.

*Table 17: Most important Alliance membership benefit*

<b>Most important Montana BioScience Alliance membership benefit</b>	<b>Number of responses</b>
New clients or business opportunities or collaboration	8
Investment or capital access	3
Community involvement or growing bioscience in Montana	2
Hiring issues discussed or access to employee candidates	1
Networking or contact in general	1

Obtaining new investment or access to capital was the 2<sup>nd</sup> most often cited (3 firms) membership benefit sought by firms. Community involvement or growing bioscience in Montana was the 3<sup>rd</sup> most often cited (2 firms) membership benefit sought by firms.

## Q22. What additional comments do you have?

Table 18 below provides the additional comments made by bioscience firms.

*Table 18: Additional comments*

1. A number of our employees are moving out of state to escape the high cost of housing in [redacted], but some jobs require people to work on site. The state and local governments have not done enough to create affordable housing for young people (first time home buyers) whose household incomes are less than \$150K. We expect to increase average salaries to \$75K in the next year or two, but that still isn't close to being high enough to afford housing here.
2. Bioscience Alliance has been extremely supportive and helpful. Thanks for all you do!
3. Business owners, CEOs, need to be exposed to more of the amenities of Montana and meet more business leaders from our state. An annual activity like a fly fishing event would be a great way to get people here.
4. Housing costs and workforce limitations will constrain future hires. Small business cannot compete with national and international companies in our region that will pay high salaries. We offer good pay and good benefits but hard to compete on pay. Have to provide flexible benefits and work schedules to maintain work force.
5. It would be helpful if a corporation could incorporate in MT and still get outside investment. It would be great if there was some support in the area of legal and IP issues. These are the most expensive and there is no help for it, leaving innovators dependent on the universities, who have a conflict of interest.
6. Montana is a long way from large markets. International shipments are expensive. Capital is difficult to raise, limited state programs to support bricks and mortar construction. These are some of the reasons we licensed out technology rather than build in-state production.
7. Provide assistance with clinical trials in Montana. We really need it!
8. Relocation funding to move manufacturing to Montana from our facility in Colorado

## Summary of Survey Findings

The survey responses tabulated in this report depict a diverse, vibrant, and growing industry. It is clear that Montana bioscience firms face many of the same challenges as the rest of the economy in the strong recovery that has characterized this post-pandemic period. Those include high housing costs and the difficulty in attracting qualified workers. The prospects for growth reported by survey respondents remains quite good.

## 5. Summary and Conclusion

The manufacturers, research laboratories, medical facilities, equipment and supply wholesalers and others who together make up the bioscience industry in Montana have an important presence in the overall economy. As this report documents, Montana bioscience jobs pay significantly above the state average, have been largely unaffected by economic downturns, and have excellent prospects for growth moving forward. By drawing on both publicly available data as well as survey responses from individual companies, this comprehensive profile of Montana's bioscience industry and its activities makes it clear that the contribution these companies make to the prosperity of the state and its regions is growing in importance.

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