# MEETING STATE WORKER DEMAND

## A REPORT ON THE LABOR MARKET OUTCOMES FOR MONTANA COLLEGES

Montana Department of
LABOR & INDUSTRY

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MTSWIB
STATE WORKFORCE INNOVATION BOARD

MONTANA
DEPARTMENT OF
REVENUE

MONTANA
UNIVERSITY SYSTEM

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# EXECUTIVE SUMMARY

The State of Montana is committed to producing a high quality workforce that meets the demands of employers. With our state anticipating a worker shortage in the upcoming years, and with the costs of education continuing to escalate, the Montana Department of Labor & Industry (MTDLI) and the Office of the Commissioner of Higher Education (OCHE) have joined forces to share data and create analytics that can be used by our state's colleges to ensure that our workforce training systems are aligned with our economic needs. Utilizing this data will help students progress through educational programs and join the labor market quickly and efficiently, saving money for students, employers, and taxpayers.

This report provides information on the expected job demand in the state, and provides analytics on whether the graduates from Montana colleges are graduating within in-demand fields, obtaining jobs quickly after graduation, and experiencing wage progression during their post-graduation careers. This data will help the post-secondary education system evaluate their talent pipeline, ensuring that their programs match the workforce needs in the business community. The information on successful job placement and wage progression will also help students choose programs that will result in the most career success with the best returns to the cost of education. This report is intended to be a starting point for continued evaluations and conversations. Any suggestions to improve the report data, analysis, or presentation are welcomed.

The OCHE provided MTDLI with data on the graduates from the sixteen colleges that are included in the Montana University System data warehouse (MUS) from 2001 to 2015. Rocky Mountain College and Carroll College also agreed to participate in this report, providing data on their graduates over the same fifteen-year period. Combined, the report includes data on roughly 100,000 individuals through 230 different academic programs. MTDLI matched this graduate data to wage records collected through the Unemployment Insurance program, then worked with the Montana Department of Revenue to include information about other sources of income earned by graduates. Finally, the graduate data was matched to employment projections produced by MTDLI.

The resulting dataset of graduates, employment projections, wages, and income records was used to answer three research questions: (1) Do colleges produce enough graduates in the right programs to fill the types of jobs required by Montana employers? (2) Do graduates find jobs in Montana, thus helping to meet statewide worker demand? And (3) Does the geographical distribution of graduates match the distribution of worker demand in Montana? In addition to these primary research questions, the report also provides additional information on the demographics, enrollment, retention, and educational outcomes of Montana college students that allows a more complete understanding of how the post-secondary system serves statewide workforce needs. Data were transferred and matched securely, and results were aggregated so that no individual student's outcomes could be identified.

The report is organized into five sections, with the first reviewing the demographic and program attendance information, answering the question "Who are Montana Students?" The second section, "Graduate Workforce Outcomes," provides the employment and wage outcomes of graduates, including breakdowns by degree, program, geography, and industry. Continuing the evaluation, the third section, "Montana Supply and Demand Analysis," answers the primary research question of whether colleges are producing enough graduates in the right fields to meet statewide worker demand, with supply and demand analysis from four different perspectives. The wages by program are presented, providing helpful information for students choosing degree programs and businesses who are seeking workers. The fourth section looks at the geographical distribution of supply and demand, asking if employers throughout the state have enough workers to meet their demands. The fifth section concludes. The methodology is presented in the appendix.

## UNDERSTANDING SUPPLY & DEMAND ANALYSIS THROUGH FOUR DIFFERENT PERSPECTIVES

This report presents three different supply and demand analyses – by industry, occupation, and program of study. These analyses are supplemented with a fourth analysis of employment and wage outcomes by program to confirm the results. Each type of analysis has its own flaws, but interpreting the results together provides greater confidence in the results.

### BY INDUSTRY

**SUPPLY:**
Average annual number of graduates employed in each industry in last three years.

**DEMAND:**
Annual industry employment growth projections.

### BY OCCUPATION

**SUPPLY:** Average annual number of graduates over the last three years who graduate from programs that prepare them to work in the occupation.

**DEMAND:** Estimated annual employment growth for high-demand occupations requiring a post-secondary education.

### BY PROGRAM OF STUDY

**SUPPLY:**
Average annual number of graduates from each program over the last three years.

**DEMAND:**
The sum of estimated annual employment growth for all occupations graduates from a program are qualified to fill.

### WORKFORCE OUTCOMES BY PROGRAM

Workforce outcomes by program help confirm the conclusions reached in the other three supply and demand analysis. Undersupplied programs should have better outcomes than oversupplied programs.

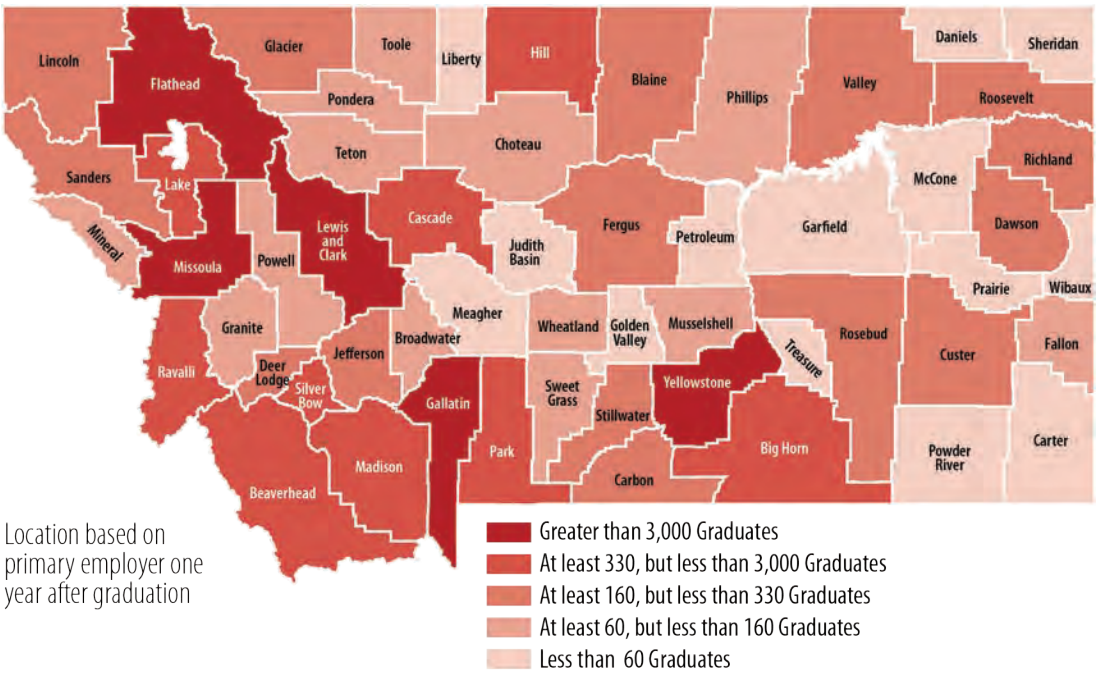
The analysis faces some drawbacks due to data limitations. Only Montana workforce data is included in this analysis. While this helps to determine whether the worker remains in Montana post-graduation, the lack of data from other states likely places downward bias on the percent of graduates employed, with greater bias for programs that help fill national talent pools. Further, the wage and income data does not include the number of hours worked, preventing calculations of hourly wages. If the graduate has higher earnings after graduation, the difference may be due to working more hours, not to higher hourly wages. Despite these limitations, important insights were gained from this analysis. Highlights are provided in the following pages.

## Nearly ¾ of Graduates stay in Montana for Work, and They Work in Every County

The majority of graduates from Montana's colleges work in Montana after graduation, thus contributing to the state's economy. Approximately 69% of graduates work in Montana one year after graduation, and 74% of graduates will work in Montana at some point within five years after graduation. Graduates' contribution to the Montana workforce occurs across the entire state. One year after graduation, Montana college graduates were working in every county in the state. Graduates disperse from the more populated areas of the state, where the colleges are located, to every corner of Montana. **Figure 2.4** shows graduates location one year after graduation.

FIGURE 2.4

### GRADUATES LOCATION ONE YEAR AFTER GRADUATION BY COUNTY



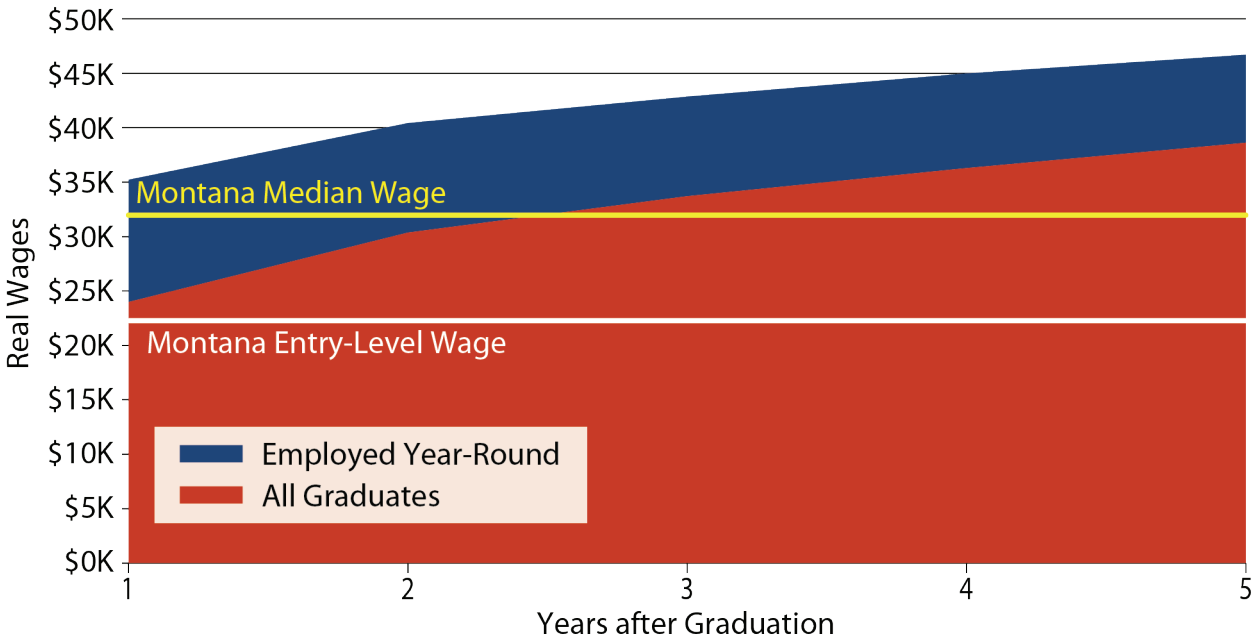

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match*

## Graduates Earn Above Median Wages within Three Years

Graduates who work in Montana earn wages above the entry-level wage within one year of graduation, and their average wage progresses above the statewide median within three years of graduation. **Figure 2.1** depicts the average wage progression of Montana college graduates after graduation.

FIGURE 2.1

## REAL AVERAGE WAGE EARNINGS FOR GRADUATES




*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Real wages reported in 2015 dollars using the CPI-U. Median and entry-level wage from 2015 Occupational Employment Statistics.*

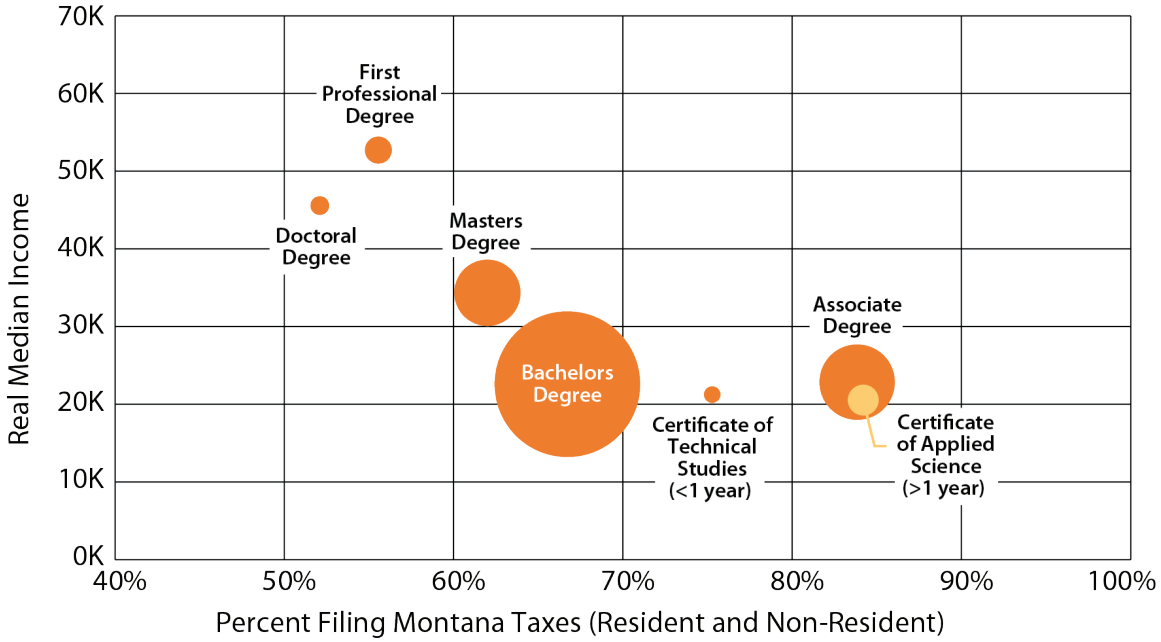
## More Education leads to Higher Incomes, but Advanced Degree Graduates are Less Likely to Work in Montana after Graduation

Higher education levels are associated with higher income levels. However, higher levels of education also have lower levels of retention in the Montana workforce after graduation. About 84% of associate degree graduates earned income in Montana a year after graduation, compared to 67% of bachelor's degree earners and 52% of PhD graduates. The negative relationship between remaining in Montana and higher education levels likely arises because individuals with more education tend to pursue high-wage jobs. Montana's high-wage jobs tend to pay less than high-wage jobs in other states, whereas low-wage jobs pay just as well in Montana as in other states.[1] **Figure 2.5** shows workforce outcomes by degree, where the horizontal axis is the percent filing income taxes one year after graduation, and the vertical axis is median income. The size of the bubble corresponds to the number of graduates in each degree type since 2001.

1 *Wagner, Barbara. 2015. "Montana's Growing Wages: Income and Wages are Gaining Ground on National Average" Montana Economy at a Glance, published by the MTDLI, May 2015. Available at lmi.mt.gov.*

FIGURE 2.5

## WORKFORCE OUTCOMES ONE YEAR AFTER GRADUATION BY DEGREE TYPE




*Source: DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Income is defined as lines 7, 12, 17, and 18 on the MT income tax return. Multiple degree holders are counted once for each degree. Income reported in 2015 dollars using the CPI-U.*

The largest drop in graduate retention occurs between an associate and bachelor's degrees. Shorter training times for associate degrees and stronger connections between two-year colleges and local labor markets result in greater retention of associate degree graduates in Montana. The lower retention rates among bachelor's degree earners is reflective of a more mobile workforce. Graduates from four-year colleges tend to be young adults, many of whom moved from other states for college. This demographic is more likely to leave Montana than older age groups, leaving in pursuit of a job offering higher wages, a better fit to their skills or career interests, or a more diverse experience. The percentage of four-year students who are Montana residents is the same as the percentage who stay in Montana a year after graduation, suggesting the four-year education system comes out even recruiting new people to Montana and retaining the existing workforce.

## Median Earnings are Similar between Bachelor's and Associate Degree Earners

Bachelor's and associate degree graduates who worked in Montana had similar median incomes. One year after graduation, associate degree earners had median incomes slightly above bachelor's degree earners.[2] However, bachelor's degree earners made more than associate earners on average, suggesting bachelor's degree graduates have greater income potential. Bachelor's degree earners also appear to have faster income growth, as their median income exceeds associate degree earners by $1,300 after five years. Data is not available to evaluate earnings ten years after graduation, although future research will evaluate earnings over longer timeframes.

2 *The income data methodology counts everyone with a bachelor's degree; even they achieved a higher degree.*

The returns to bachelor's degree attainment compared to an associate degree vary widely by program. **Figure 2.6** shows the programs with the highest and lowest returns to bachelor's degree attainment over five years. Programs like information technology, construction engineering technology, health information technology (HIT), and education have significantly higher wages in Montana for bachelor's degree attainment. Five years after graduation, graduates holding a bachelor's in information technology were making more than twice the earnings of graduates with an associate degree in the same program. Construction engineering graduates with a bachelor's degree earn nearly $24,000 more than graduates with an associate degree after five years.

In contrast, allied health, intervention and treatment, public safety, and engineering technology programs have lower wage outcomes for bachelor's degree earners compared to associate degree earners after five years. Many of the occupations associated with these programs do not require a bachelor's degree. Visual and performing arts, and registered nursing programs have less than a 5% wage difference between associate and bachelor's degree earners.

## FIGURE 2.6

## PROGRAMS WITH THE LARGEST AND SMALLEST WAGE PREMIUM FOR BACHELOR'S DEGREE ATTAINMENT

| | Program | Associate Degree | | Bachelor's Degree | | Wage Premium | |
|---|---|---|---|---|---|---|---|
| | | 1 Year | 5 Year | 1 Year | 5 Year | 1 Year | 5 Year |
| Largest Premiums | Information Technology | $21,480 | $33,559 | $51,136 | $69,928 | $29,656 | $36,370 |
| | Construction Engineering | $21,199 | $31,752 | $30,738 | $55,719 | $9,539 | $23,968 |
| | HIT and Medical Coding* | $21,533 | $25,559 | $27,543 | $44,773 | $6,010 | $19,215 |
| | Secondary Education | $13,820 | $19,411 | $21,430 | $32,772 | $7,609 | $13,361 |
| | Early Childhood Education | $18,584 | $21,350 | $25,731 | $34,098 | $7,147 | $12,749 |
| Smallest Premiums | Transport/Material Moving | $20,455 | $32,332 | $16,661 | $34,867 | ($3,793) | $2,535 |
| | Health Tech/ Assistant | $34,173 | $43,452 | $22,089 | $46,087 | ($12,084) | $2,636 |
| | Visual and Performing Arts | $15,664 | $21,991 | $13,994 | $22,855 | ($1,670) | $864 |
| | Registered Nursing | $41,526 | $49,556 | $41,110 | $51,016 | ($442) | $1,460 |
| | Engineering Tech, Other | $29,196 | $50,629 | $32,497 | $49,221 | $3,300 | ($1,408) |
| | Public Safety | $23,553 | $42,193 | $23,288 | $35,871 | ($265) | ($6,323) |
| | Allied Health Diagnostic, Intervention, Treatment | $32,984 | $45,678 | $16,418 | $30,467 | ($16,567) | ($15,210) |

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Average wages reported in 2015 dollars using the CPI-U.*
** = Associate Degree column represents wage outcomes for Certificate of Applied Science because it is more common.*
*Graduates are categorized by program based on the highest degree they earned from MT colleges.*

## Bachelor's Graduates Recover Tuition Costs in 16 Months; Only 8 Months for Associate Degrees

College can be expensive, but Montana graduates can recover tuition costs in less than two years. A bachelor's degree graduate earns median earnings of roughly $22,500 during the first year after graduation. It would take 16.1 months of wage earnings at $22,500 annually for the graduate to earn wages equal to the average tuition costs for a four-year degree program. Associate degree earners take only 7.2 months to earn enough to cover the average tuition costs for an associate degree. The time to cost recovery varies by program.

## Two-year Colleges offer an Affordable On-ramp to Bachelor's Degree Attainment

Students coming directly to a four-year college from high school spend $25,000 in tuition for a bachelor's degree, on average, compared to $24,000 for students who transfer from a two-year college.[3] Cost savings allow transfer students to recover their tuition costs six months faster than new students. However, the cost savings vary by program. The cost savings are the greatest for students who are interested in programs with below-average workforce outcomes – such as liberal arts, social science, and communication programs. For example, students who transfer from a two-year college to earn a bachelor's in general studies save about $7,000 on average compared to going directly into the bachelor's program, allowing them to recover tuition costs six months faster. **Figure 2.12** shows the transfer cost savings and break even periods by program for programs with the largest savings. A green check mark indicates transfer students had tuition cost savings and shorter break even periods than new students.

FIGURE 2.12

### PROGRAMS WITH THE LARGEST TRANSFER COST SAVINGS

| Program | New Students | | | Transfer Students | | |
|---|---|---|---|---|---|---|
| | Cost | Break Even Months | Avg. Wage 1Yr After Grad | Cost Savings | | BE Diff |
| **AVERAGE, ALL PROGRAMS** | **$25,320** | **16.1** | **$23,974** | ✓ | **$1,324** | **5.4** |
| Foreign Languages and Literatures | $25,885 | 19.9 | $14,014 | ✓ | $1,753 | 7.3 |
| General Studies | $29,429 | 15.7 | $21,333 | ✓ | $6,940 | 6.2 |
| Mass Communication | $26,328 | 15.9 | $18,873 | ✓ | $6,752 | 6.4 |
| Parks & Recreation | $26,595 | 19.7 | $14,553 | ✓ | $3,589 | 4.8 |
| Communication Studies | $25,319 | 16.7 | $16,897 | ✓ | $4,721 | 4.5 |
| Public Safety | $29,991 | 15.1 | $22,314 | ✓ | $7,240 | 3.9 |
| Public Relations | $24,860 | 14.3 | $20,138 | ✓ | $4,400 | 3.8 |
| History | $26,038 | 19.2 | $14,907 | ✓ | $2,258 | 3.8 |
| Business | $25,541 | 13.6 | $21,819 | ✓ | $3,321 | 3.5 |
| Computer/Info Science, Other | $27,695 | 11.5 | $28,824 | ✓ | $7,894 | 3.5 |
| Psychology | $25,139 | 18.0 | $15,781 | ✓ | $3,409 | 3.2 |
| Visual and Performing Arts | $26,558 | 20.7 | $13,892 | ✓ | $2,007 | 3.2 |
| Social Work | $26,744 | 15.7 | $19,397 | ✓ | $4,980 | 3.0 |
| Health Science, Other | $25,018 | 16.7 | $16,105 | ✓ | $2,057 | 3.0 |

*Source: MUS warehouse, OCHE. Costs based on average in-state tuition per credit at two-year and four-year colleges in MT, and average credits to degree. RMC and CC data not included. Student loan information not included. NA=not available. Average wage reported in 2015 dollars using CPI-U.*

3 *The cost of tuition is calculated based on the number of credits students took to graduate, and the average in-state cost per credit at two-year and four-year colleges in the MUS data warehouse. RMC and CC graduates and costs are not included.*

Programs with above-average wages in the year after graduation, like registered nursing, engineering, and computer science, have short break even periods. Students in these programs who go directly to a four-year program from high school tend to spend less on tuition and recover costs faster than students that transfer from a two-year college.

## Graduates Work in their Field of Study

Most graduates in Montana work in industries commonly associated with their degree after graduation. Consistent matches between program of study and industry of employment indicates graduates are well prepared to work in their field of study, and their field of study is in demand.

The healthcare industry and the education industry employ the most graduates from Montana's colleges. Three-fourths of healthcare graduates working in Montana are employed in the healthcare industry. Another 6% of healthcare graduates are working in retail trade, likely in pharmacies in grocery and drug stores like Safeway, Costco, or Walgreens. Similarly, 73% of education graduates are employed in Montana's education industry five years after graduation.

Over time, graduates who remain employed in Montana tend to move into higher-paying industries. Accommodation and food service, and retail trade industries employ about 20% of graduates a year after graduation, but only 11% five years after graduation. The drop in employment over time suggests graduates were working as retail sales workers or waiters temporarily while searching for career opportunities in higher-paying industries. These industries may also be providing valuable training to graduates who need to build soft skills before they can find a job in higher-paying industries.

## Montana Colleges Meet Demand for Most Occupations, but Retention and Distribution Create Shortages

The supply and demand analysis by program identified 56% of Montana college programs have produced more graduates than demanded for the field. Fifty-four of the 96 educational programs are oversupplied. The oversupplied programs are primarily in communication, liberal arts, education, and social science. Many of the oversupplied programs have below-average workforce outcomes. The supply and demand analysis suggests colleges are meeting demand for 5% of high-demand occupations requiring a postsecondary degree, and oversupplying 63% of occupations. Difficulty in filling these positions likely results from the distribution and retention of graduates -- not training capacity.

Another 10% of high-demand occupations are undersupplied, meaning colleges have not graduated enough workers to fill the expected number of openings. About a 21% of high-demand occupations are not associated with any programs currently offered at colleges included in this study. Most of the areas for new program development are in healthcare.

FIGURE 3.5

## SELECT HIGH-DEMAND OCCUPATIONS BY SUPPLY AND DEMAND CATEGORY

| Undersupplied | No Program (Median Wage> Statewide) | Meets Demand | Oversupplied (% Ed Level is 100%) |
|---|---|---|---|
| • Teacher Assistants<br>• Nursing Assistants<br>• Dental Assistants<br>• Automotive Service Techs & Mechanics<br>• Heating, Air Conditioning, Refrigeration Mechanics & Installers<br>• Training and Development Specialists<br>• Paralegals and Legal Assistants<br>• Human Resources Specialists<br>• Clergy<br>• Medical & Clinical Laboratory Technologists | • Heavy and Tractor-Trailer Truck Drivers*<br>• Business Operations Specialists<br>• Purchasing Agents<br>• Compliance Officers<br>• Occupational Therapists<br>• Dentists<br>• Family and General Practitioners<br>• Veterinarians<br>• Chiropractors<br>• Optometrists<br>• Psychiatrists | • Dental Hygienists<br>• Personal Financial Advisors<br>• Graphic Designers<br>• Mental Health Counselors<br>• Nurse Practitioners | • Radiologic Technologists<br>• Web Developers<br>• Physical Therapist Assistants<br>• Loan Officers<br>• Civil Engineers<br>• Child/Family/School Social Workers<br>• Elementary School Teachers<br>• Middle School Teachers<br>• Secondary School Teachers<br>• PR & Fundraising Manager<br>• Financial Managers<br>• Mental Health & Substance Abuse Social Workers<br>• Mechanical Engineers<br>• Physical Therapists<br>• Physician Assistants<br>• Education Administrators<br>• Ed, Guidance, School, & Vocational Counselors<br>• LPN and LVNs<br>• EMTs and Paramedics<br>• Medical Records & HIT<br>• Medical Assistants<br>• Bookkeepers, Accounting & Auditing Clerks |

*Source: MTDLI 2015-25 employment projections. OCHE, RMC, and CC graduate data. Only oversupplied occupations where all of the college supply has the typical education level required for the occupation are included. Occupations with a median wage above the statewide median are shown in the no program category. *Heavy & Tractor-Trailer Truck drivers require a commercial driver's license, which is not included in Montana college graduate data.*

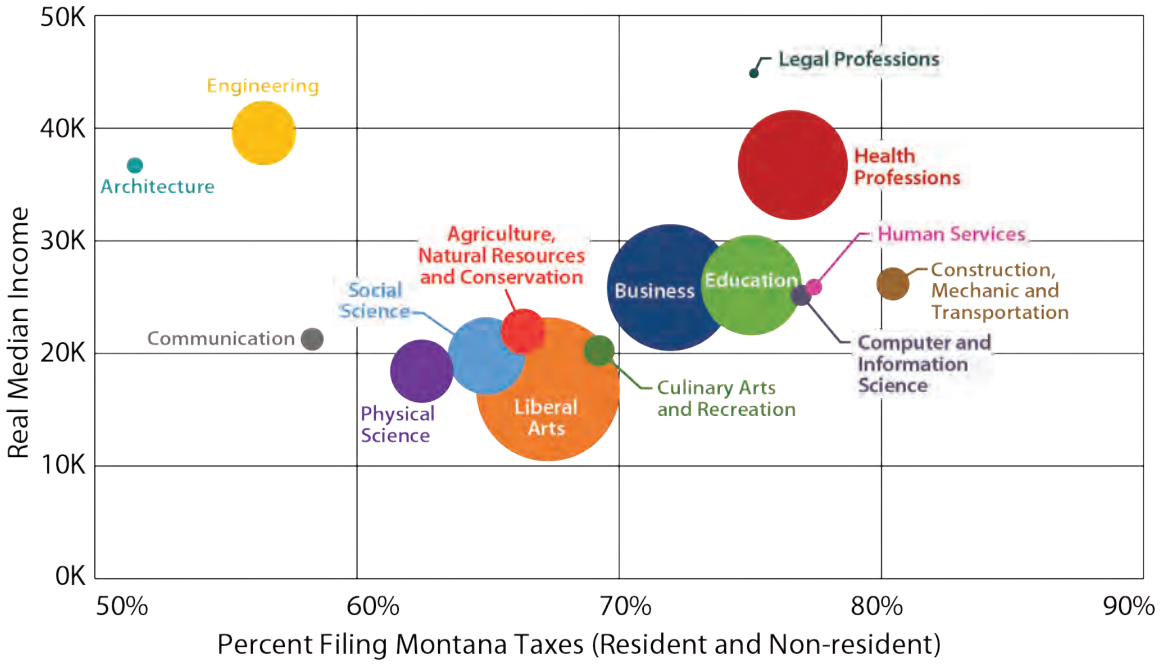
## Technology Degrees Highlighted for Potential Capacity Expansion

Of the thirty-three programs identified as undersupplied, seven were identified as potential expansion candidates. Potential expansion programs must have at least 80% of their demand from occupations requiring a post-secondary education and be the primary source of workers for high-demand occupations. Candidates for program expansion include the three computer and information science programs, automotive technology, mechanic repair technology, social work, and health information technology (HIT) and medical coding.

Computer and IT programs and social work programs have above-average income and retention. **Figure 3.10** shows the workforce outcomes by program category one year after graduation. Social work falls in the human services category, and computer and information science programs are grouped together. The size of the bubble represents the number of graduates in each program category since 2001. The location of the bubble within the chart provides the median income of graduates one year after graduation on the vertical axis, and the percent of graduates filing Montana income taxes on the horizontal axis. The chart only includes Montana income and employment.

FIGURE 3.10

## WORKFORCE OUTCOMES BY PROGRAM CATEGORY ONE YEAR AFTER GRADUATION




*Source: DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Earned income is defined as lines 7, 12, 17, and 18 on the Montana income tax return, not including farm income. Income reported in 2015 dollars using the CPI-U.*

Mechanic repair technology and automotive technology programs are expansion candidates at the two-year college level, with above-average workforce outcomes and demand exceeding supply. Both programs fall within the construction, mechanic and transportation category. Both programs have over 80% retention rates in the Montana workforce a year after graduation, which is consistent with programs commonly offered at two-year colleges. Median incomes for mechanic repair and automotive technology graduates are above the median income for associate degree earners.

The HIT and medical coding program is undersupplied, but employers are not offering higher wages for HIT graduates. The income reported by HIT graduates is similar to other certificate programs, and retention one year after graduation is slightly less than average. Based on the workforce outcomes, expanding HIT and medical coding programs is unlikely to be a priority among two-year colleges.

## General Studies is the Largest Program and is Oversupplied with Below Average Outcomes

The general studies programs are the most significantly oversupplied, consistently oversupplying graduates in every region of the state. According to the Bureau of Labor Statistics, there are few occupations that someone with a general studies is prepared to fill. The occupations tied to the general studies program have slow projected growth in Montana. Despite minimal demand, colleges in Montana have produced an average of 865 general studies graduates per year (over the last three academic years), making general studies the largest program. Students who graduate with a degree in general studies have lower workforce outcomes than the average graduate.

The general studies program is designed as a transfer program and may meet demand from students who are unsure of their career interests; however, only 40% of associate degree graduates in general studies go on to achieve a bachelor's degree or higher. Students who are unsure of their career interests may be better served by the business program. Business graduates with an associate degree are only 4% less likely to achieve a bachelor's degree than general studies graduates, but they earn $7,000 more a year after graduation, and are 6% more likely to work in Montana after graduation. The workforce outcomes and educational attainment for both associate degree programs are shown in **Figure 2.8**.

FIGURE 2.8

### WORKFORCE OUTCOMES AND EDUCATIONAL ATTAINMENT FOR SELECT ASSOCIATE DEGREE PROGRAMS

| Program | Total Graduates | % Obtaining a Bachelor's | % Filing Income Taxes | Real Median Income |
|---|---|---|---|---|
| **All Programs** | **18,960** | **20%** | **84%** | **$22,850** |
| Business | 600 | 36% | 85% | $20,899 |
| General Studies | 4,660 | 40% | 79% | $13,049 |

*Source: DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Income reported in 2015 dollars using the CPI-U.*

If a student wishes to pursue a bachelor's degree in general studies despite the low demand and poor outcomes, they are better off transferring from a two-year college. General studies bachelor's degree earners save about $7,000 in tuition on average by attending a two-year college first. Bachelor's degree general studies graduates take an average of sixteen months to earn wages equal to their tuition costs, but graduates who transferred from a two-year college recovered their tuition costs in less than a year.

## The Supply of Registered Nurses Meets Demand, but Distribution and Retention may Still Cause Hiring Difficulties

Nursing is the largest occupation in the rapidly growing healthcare industry, and has the most projected job openings of any occupation typically requiring a bachelor's degree in Montana. Montana colleges have increased their production of registered nurses over the last few years in response to the growing demand. Over the last five years, colleges have increased their registered nurse capacity by 42%. Over 500 students now graduate from registered nursing programs in Montana each year.[4] This production is greater than the estimated openings, suggesting Montana's colleges have the capacity to meet employer demand for registered nurses. However, because the growth in registered nurse capacity is relatively recent, there are likely a number of unfilled registered nurse openings resulting from the undersupply in prior years. It may take years of sustained registered nurse production above demand in order to fill the backlog.

Both associate and bachelor's degree nurses are needed to meet worker demand. Only about 56% of the registered nurse graduates hold a bachelor's degree, which is insufficient to meet demand without hiring associate degree earners. Earnings between associate and bachelor's degree earners are similar. Five years after graduation, bachelor's degree registered nurses were only making 3% more than associate degree earners in the same field.

Montana colleges have the statewide capacity to meet projected demand for registered nurses, but only 84% of registered nurse graduates stayed in Montana to work. While this graduate retention is higher than average and signals strong employer demand, the 16% of registered nurses who leave the state may cause tightness in the labor market for registered nurses. Further, regional analysis shows both the Northwest and South Central regions are undersupplied for registered nurse graduates. Registered nurse graduates from the oversupplied regions need to fill openings in the Northwest and South Central. Labor force mobility is a critical element of ensuring all employers have access to a well-trained workforce.

## Regional Analysis shows Unmet Demand in Rural Areas, but Migration Fills Gaps

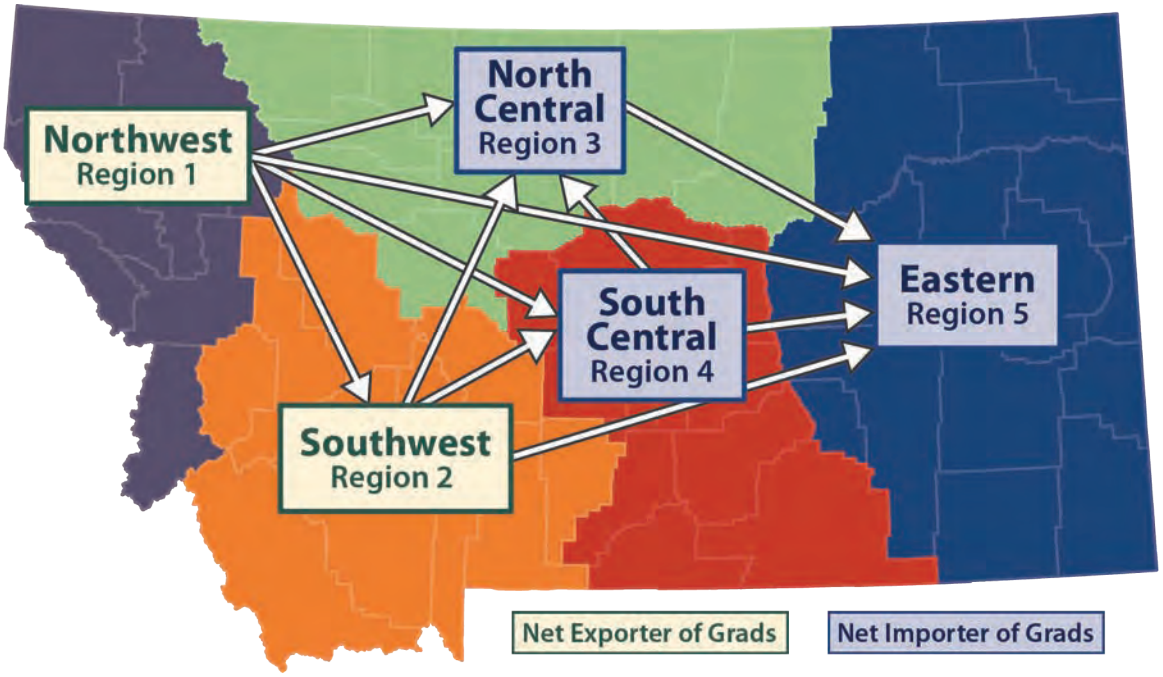
Graduate migration helps alleviate some of the regional discrepancies in worker supply and demand. The rural regions of the state have more significant unmet demand than the populated regions. Employers in the Eastern and Central regions rely on graduates from the west to help fill demand. As a result, students migrate after graduation from the more populated western regions into the rural areas where there is unmet demand. **Figure 4.6** illustrates the migration patterns of graduates a year after graduation. The Northwest and Southwest regions are net exporters of graduates, and the North Central, South Central, and Eastern regions are net importers.

4 *RN production excludes graduates with a master's in registered nursing, who typically become nurse practitioners.*

FIGURE 4.6

## REGIONAL MIGRATION OF GRADUATES A YEAR AFTER GRADUATION

from 2010-2015




*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Excludes years prior to 2010 due to lack of Region 5 data. Arrows show net migration between regions.*

Despite the large number of workers demanded by employers in the west, the Southwest and Northwest tend to produce more graduates than demanded by the region. Both the Southwest and Northwest regions are net exporters of graduates, meaning more graduates leave the region after graduation than come from other regions to work. The other three regions of Montana are net importers of graduates. These regions do not produce as many graduates, and graduates from the west migrate into these regions after graduation to help fill demand.

In areas with substantial unmet demand, a limited worker supply should put upward pressure on wages. Graduates appear to be responding to these forces and moving to the areas with the greatest need. Colleges often focus on serving their local labor force, and they are an important source of labor for local employers. However, graduate migration is also an important part of a healthy state economy.

# INTRODUCTION

Due to our aging demographics and strong job growth since the recession, Montana is expecting a worker shortage in the next ten years.[5] As workers become increasingly hard to find, time spent out of the workforce to obtain education and job training becomes more expensive for workers, businesses, and our economy. At the same time, the cost of the education system continues to increase for both students and taxpayers.[6] Part of the solution for both of these challenges is to ensure that students are choosing career paths that lead them to the occupations needed by employers, and that the training program is efficiently and effectively providing a skilled workforce for the Montana economy.

Recognizing these global forces, the Montana Department of Labor & Industry (MTDLI) and the Office of the Commissioner of Higher Education (OCHE) have partnered to share data and create analytics that can be used by our state's colleges to ensure that our workforce training systems are aligned with our economic needs. While many colleges have attempted to generate their own internal analysis at the local level, the state agencies charged with overseeing education and workforce training are in a unique position to provide evaluation data for all schools in a uniform manner, and provide comparative statistics so that colleges can evaluate themselves compared to statewide averages. This report is intended to be a starting point for continued evaluations and conversations. Any suggestions to improve the report data, analysis, or presentation are warmly welcomed.

The data for this report comes from the employment projections from MTDLI for the state, with analysts matching the programs at each educational institution to the skills and education levels required in each occupation. The forecasts of worker demand from employers was then matched with the supply of workers prepared for each field using administrative data from OCHE, Rocky Mountain College, and Carroll College to conduct supply and demand analysis. The analysis identifies gaps where our education and training systems are not meeting the worker needs and skill needs of Montana employers. The report includes data from the eighteen educational institutions shown in **Figure 1.0**.

These colleges make up the majority of the educational institutions in Montana, but there are still others not included in this report. The excluded educational institutions are those where MTDLI does not have an existing data agreement with the institution. Future versions of this report will attempt to expand the included institutions. The most notable exclusions are Montana's tribal colleges, University

5 *Wagner et al. 2016. "2016 Labor Day Report" published by the Montana Department of Labor & Industry. Available at http://lmi.mt.gov/Publications/PublicationsContainer/labor-day-report-2016.*

6 *Average tuition cost by MUS college is provided by OCHE at: https://mus.edu/data/tuition_and_fees/tuition_and_fees.asp. Data show rising tuition costs since 2001.*

FIGURE 1.0

## LOCATION OF COLLEGES INCLUDED IN GRADUATE SUPPLY


of Great Falls, and apprenticeship programs.[7] The supply of workers from the eighteen colleges is expected to meet the majority of the worker demand, but there may be other programs that work to meet 100% of worker demand.

The Montana economy is projected to add roughly 5,500 jobs per year through 2025, translating to about 1.2% growth annually. Faster growth is expected in the near term due to strong job growth momentum in recent years. Job growth is expected to slow in the long run due in part to restricted labor supply resulting from the state's aging population. Over 11,900 workers will retire or otherwise leave their jobs in Montana every year through 2025. These replacement openings combined with annual employment growth of 5,500 jobs means that Montana will need roughly 17,400 workers each year to fill job openings. Workers who retire will need to be replaced by new workers, who will need to be trained through the education system. Individuals switching between jobs may also need additional training to meet employer's needs.

Montana's robust economic growth has maintained historically low unemployment rates around 4.0%. While low unemployment rates signal employment opportunities for graduates, sustained low unemployment rates are a sign of tight labor markets that can make it difficult for employers to find the workers they need. Higher wages and more job opportunities will help attract workers to Montana and increase labor force participation rates. However, these natural market forces may not be enough to fill the demand for workers. Understanding workforce supply from Montana's college pipeline is a timely task in the face of workforce shortages throughout the state.

7 *Tribal colleges were contacted, but did not provide data. MTDLI has made significant improvements in data collection for the apprenticeship program. Future reports will include apprenticeships, but the data was not available at the time of this report.*

The administrative data on graduates available through OCHE, Rocky Mountain College, and Carroll College were also matched to wage and income records maintained by MTDLI and the Montana Department of Revenue (DOR). Matching graduate data with income and wage data provides an understanding of the workforce outcomes of graduates, allowing us to determine whether graduates obtain lucrative careers in Montana after graduation. The match between graduate data and UI administrative wage records was governed by the security requirements outlined in the Memorandum of Understanding between the MTDLI and OCHE, which was designed to protect the confidentiality of the unemployment insurance wage files and protect the privacy of graduates. The resulting information provides insight on how quickly each graduate finds a job, whether that job is steady employment, and whether the student is experiencing wage progression in the five years after graduation. However, the UI administrative wage records only capture payroll employment. In order to capture other forms of income, such as self-employment and personal contracting income, the graduate data were also matched to income tax records maintained by DOR.

The graduate workforce outcomes is critical to understanding and confirming of the supply and demand analysis, as the in-demand fields should have higher job placement and better wages than occupations where colleges are oversupplying the labor market. Workforce outcomes also provide information on whether graduates work in Montana, thus helping businesses meet their worker demands and grow the state economy, or if the graduates leave Montana after graduation. Income and employment information is also necessary for program evaluation. Mismatches between program of study and industry of employment may indicate that the skills taught within the educational program are not the skills needed for employment success, suggesting that curriculum updates may be needed.

## How do you know how many workers will be needed?

Projections on industry and occupational worker demand come from the Montana Department of Labor & Industry 2015-2025 projections. Worker demand is comprised of two sources: workers needed to fill new jobs, and workers needed to fill openings created by retirements or career changes. As Montana's population continues to age, the post-secondary training system will need fill job openings generated by retirements as well as new job openings. Individuals looking to change careers may also need retraining from the post-secondary system.

The post-secondary training system is considered to have met demand if supply falls within a range, where the lower bound is equal to the number of new job openings and openings due to retirements. The upper bound is total job openings, which includes career changes (job-to-job openings).

Finally, employment outcome information is helpful for students searching for a degree program that ensures their employability after college. This report also provides analysis on how quickly graduates recover their costs of education based on the average cost of tuition per credit by college type and the time-to-completion for graduates from different programs and degrees.

The report is organized into five sections, with the first reviewing the demographic and program attendance information, answering the question "Who are Montana Students?" The second section, "Graduate Workforce Outcomes" provides a summary of the workforce outcomes of graduates in Montana, including breakdowns by degree, program and industry. Continuing the evaluation, the third section, "Montana Supply and Demand Analysis", answers the primary research question of whether colleges are producing enough graduates in the right fields to meet statewide worker demand, with supply and demand analysis from three different perspectives. The wages by program are presented, providing helpful information for students choosing degree programs and businesses who are seeking workers. The fourth section, "Regional Supply and Demand Analysis", looks at the geographical distribution of supply and demand, asking if employers throughout the state have enough workers to meet their demands. The fifth section concludes. The methodology is presented in the appendix. Utilizing the supply and demand analysis will help students join the labor market quickly and efficiently, saving money for students, employers, and taxpayers.

The analysis faces some drawbacks due to data limitations. Only Montana earnings data is included in this analysis. While this helps to determine whether the worker remains in Montana post-graduation, the lack of data from other states likely places downward bias on the percent of graduates employed, with greater bias for programs that help fill national talent pools. Further, the wage data does not include the number of hours worked, preventing calculations of hourly wages and making it difficult to determine whether workers are "better off" post-graduation. If the graduate has higher wage earnings after graduation, the difference may be due to working more hours, not to higher hourly wages. However, the insight provided through the partial match was deemed valuable enough to share with these limitations.

SECTION ONE:

# WHO ARE MONTANA STUDENTS?

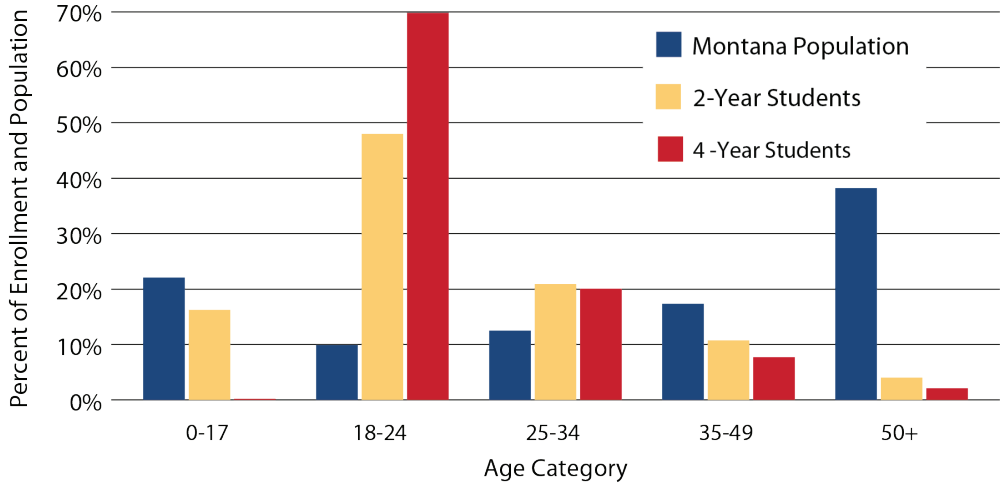
Demographics and enrollment trends of college students in Montana is available for students from all sixteen colleges in the Montana University System data warehouse (MUS). Information on student demographics and enrollment trends was not collected from the private colleges included in this study.

Montana college students are a diverse group of learners, who come from a variety of backgrounds. Understanding their demographics, enrollment, and educational attainment helps to provide important information on recruitment and retention at Montana's colleges, and provides a lens through which to understand how students progress in the Montana workforce after graduation.

## 1.1 Demographics of Montana Students

Montana college students span all ages, ethnicities, and backgrounds. The demographics of students varies depending on the type of college they are attending. About two-thirds of students are enrolled at a four-year institution, compared to one-third at two-year colleges. Students at two-year colleges are most commonly Montana residents looking for short-term job training. Most four-year students are between the ages of 18 and 24, and are more likely to have moved to Montana from other states than two-year students. **Figure 1.1** demonstrates the age differences between students at two-year and four-year colleges, compared to the overall Montana population. Two-year college students are a closer representation of the age of Montana's population compared to four-year colleges.

FIGURE 1.1
AGE DISTRIBUTION OF ENROLLMENT



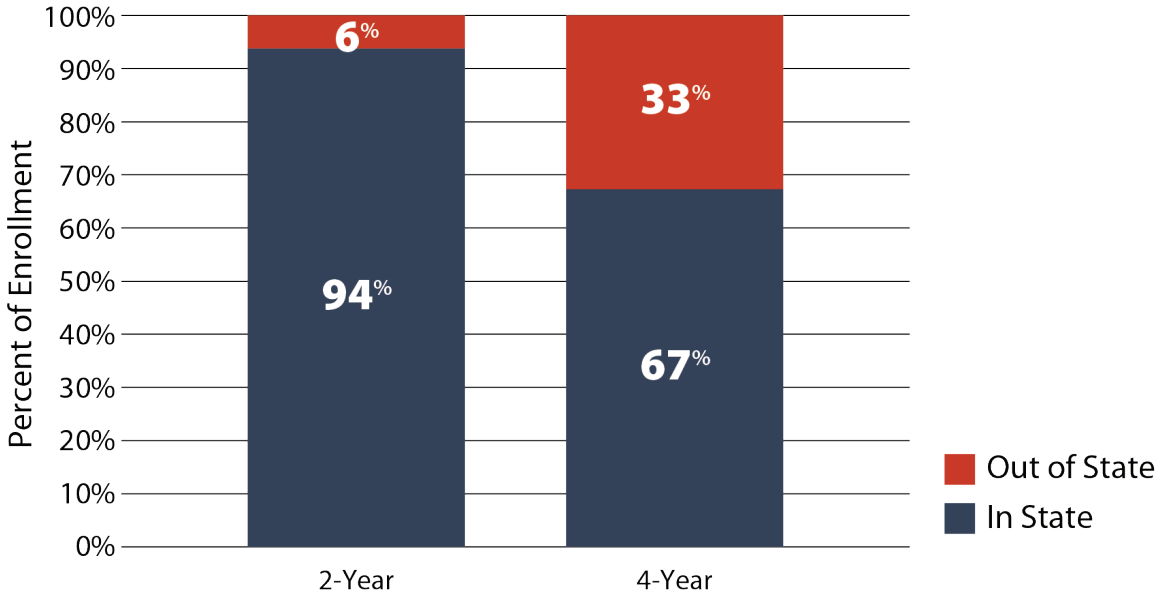

*Source: MUS Warehouse, fall 2016 Enrollment end of term. Montana data from American Community Survey 2011-2015.*

Dual enrollment of high school students explains the high level of under 18 enrollment at two-year colleges. Over the last four academic years, dual enrollment has grown by 115%, allowing high school students to earn college credit and get a head start in their college education. Two-year colleges also have more students age 25 and older than four-year institutions. The larger adult population is reflective of the two-year college history rooted in workforce development, serving adults seeking short-term job training.

Dual enrollment among high school students has grown by **115%** since 2012, causing the age of students enrolled in two-year colleges to fall.

Four-year colleges tend to attract more traditional-aged students between 18 and 24. Traditional students make up 70% of enrollment at four-year colleges, compared to only 48% at two-year colleges. Four-year colleges have a greater capacity to serve recent high school graduates, with more housing and dining options than two-year colleges. For the same reasons, four-year colleges are also able to attract more out-of-state students. **Figure 1.2** shows the percentage of in-state and out-of-state students at two- and four-year colleges. Thirty-three percent of students at four-year institutions come from other states, compared to only six percent at two-year colleges.

## FIGURE 1.2
## STUDENT RESIDENCY BY COLLEGE TYPE

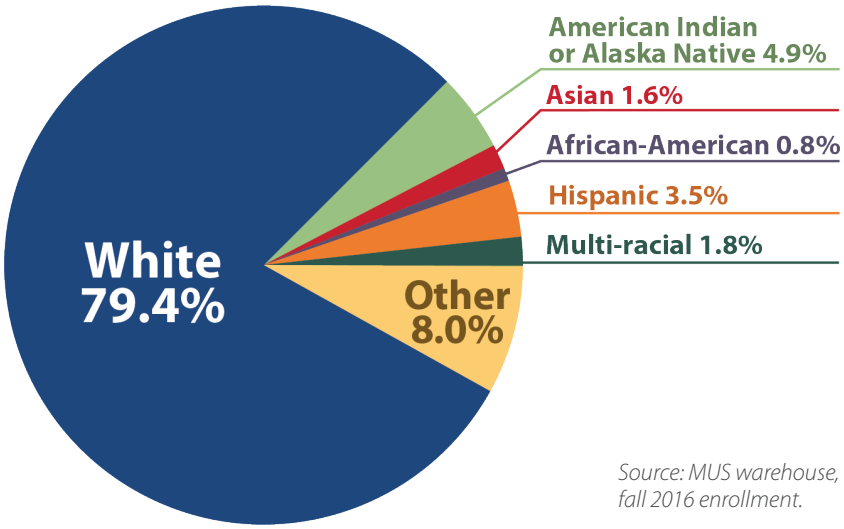



*Source: MUS warehouse, fall 2016 enrollment. To be considered a resident, students must live in Montana for a year and completed steps necessary to become a full resident*

Enrollment among the two-year colleges is more predominately female compared to four-year colleges, where enrollment is evenly male and female. Females make up 58% of enrollment at two-year colleges. Female enrollment at two-year colleges stems from the nursing and allied health majors, programs that are predominantly female and have very large enrollments. General studies and business are also large programs at two-year colleges that have disproportionate female enrollment.

Both two and four-year institutions have a large population of students identifying as white, which is consistent with the racial composition of Montana's population. **Figure 1.3** shows enrollment by race at Montana's colleges. College enrollment is slightly more diverse than the state population, with only 80% identifying as white, compared to 87% of the state's population. American Indians are slightly underrepresented in Montana colleges, with only 5% identifying as American Indian compared to 6.3% of the state. However, Montana's tribal colleges are not included in **Figure 1.3**.

FIGURE 1.3
RACIAL COMPOSITION OF ENROLLMENT




*Source: MUS warehouse, fall 2016 enrollment.*

## 1.2 College Enrollment Trends

College enrollment has been growing over the last twelve years. Since the 2003-04 academic year, college enrollment has grown by 12%. Much of this growth has been driven by increased enrollment at two-year colleges. **Figure 1.4** shows the headcount in select Montana colleges over the last twelve years. The state's flagship universities, Montana State University and the University of Montana, are colored red. The four regional universities are colored blue, and the two-year colleges are green.

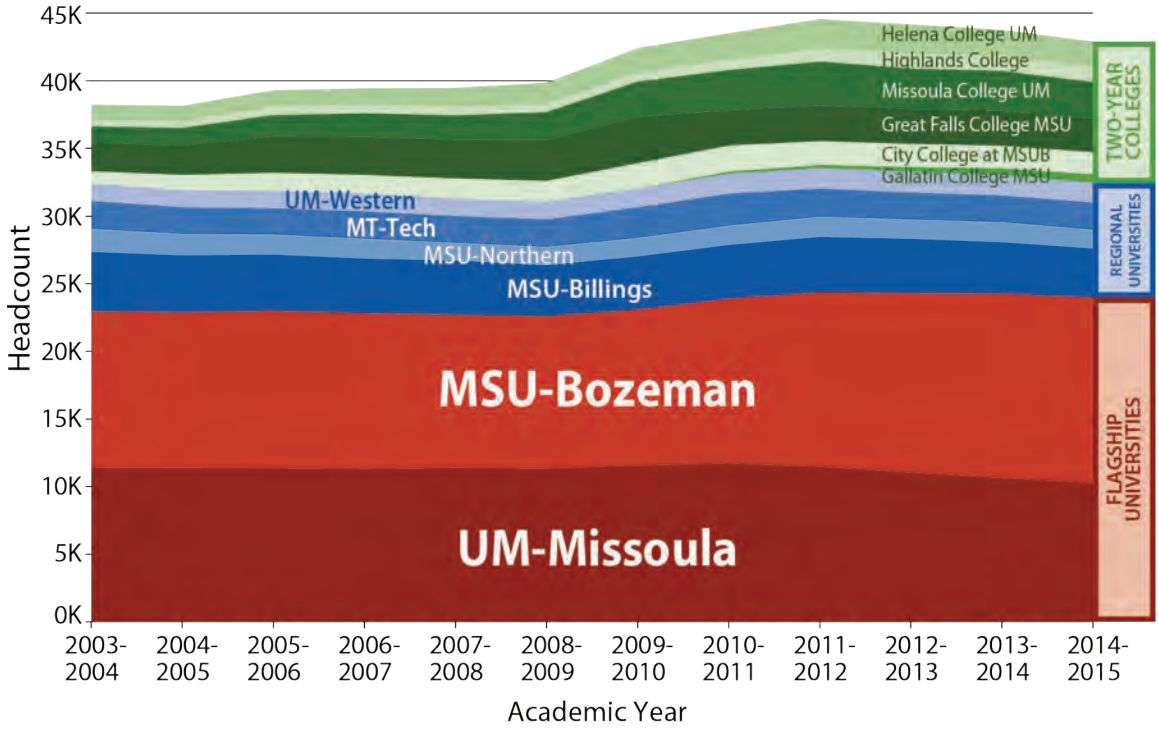
College enrollment has grown by **12%** since 2003-2004.

College enrollment is driven by a number of factors, and changes can occur irrespective of an institution's performance. For example, enrollment growth accelerated during the 2008 recession when many people found themselves out of work and chose to go back to school to improve their employment prospects. Since the recession, Montana's economy has recovered and is now experiencing low unemployment rates and tight labor markets. Tight labor markets put upward pressure on wages, and as wages increases, so do the opportunity costs of attending college.

Two-year college enrollment tends to be more sensitive to changing economic conditions. Many two-year colleges experienced significant increases in enrollment during the recession, which are now tapering off as Montana's economy has recovered. Two-year college students are more likely to have connections to the state's labor market, which helps explain why enrollment at two-year colleges is sensitive to changes in the Montana economy. Enrollment at the state's flagship and regional universities has been relatively stable over-time.

FIGURE 1.4

## NUMBER OF STUDENTS AT SELECT MONTANA COLLEGES




*Source: MUS Warehouse, Summer 2003 to Spring 2015 Enrollment end of term. Flathead Valley Community College, Dawson Community College, and Miles Community College were excluded due to lack of historical data availability.*

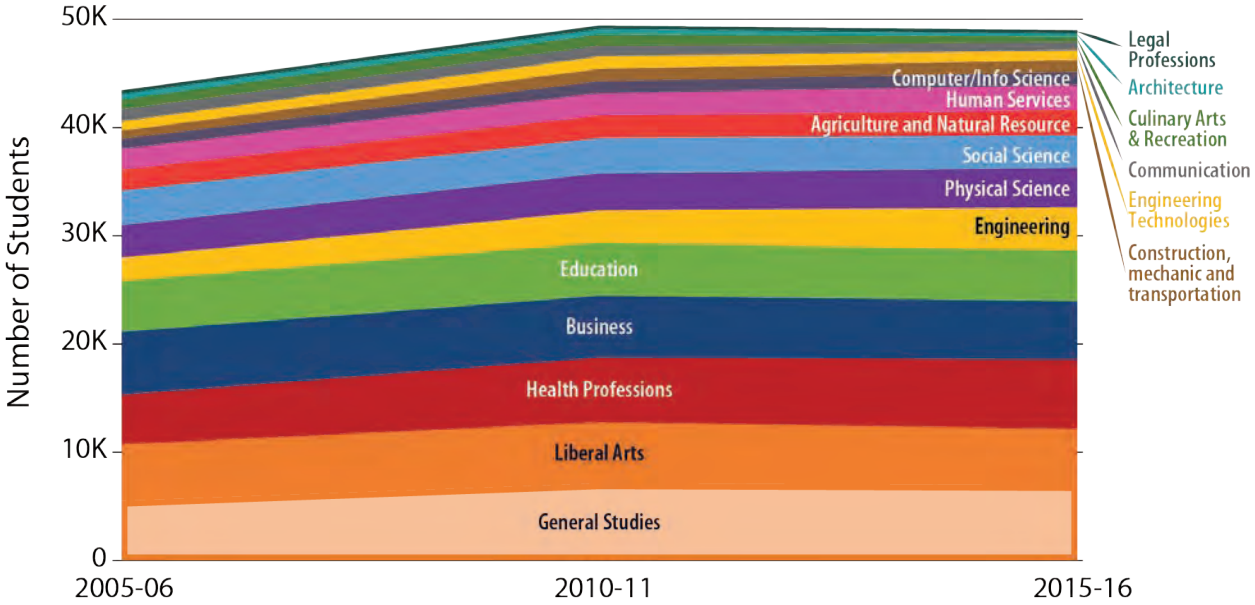
The most popular program category among enrollees is liberal arts. A quarter of students are enrolled in liberal arts programs, such as art, general studies, English, history, and philosophy. General studies is the largest program within liberal arts, making up 14% of enrollment. The general studies program is designed to help students explore their career interests prior to transferring to a four-year program. However, its popularity extends beyond two-year college enrollment. Over the last five years, general studies enrollment has fallen slightly, but the liberal arts program category continues to grow. **Figure 1.5** shows enrollment by program category at Montana over the last ten years.

Health professions is the second most common program category among enrollees. The largest program within the health professions field is nursing. Over the last ten years, enrollment in health professions has risen by 40%, responding to a growing healthcare field in the Montana economy. Healthcare employment has been growing consistently, and lucrative employment opportunities have increased the attractiveness of healthcare careers.

Business programs are also very common programs of study among college students. However, enrollment in business programs has fallen slightly over the last ten years, dropping by about 7%. Despite this drop off, business remains one of the more popular programs of study, likely because it provides training that can be utilized in many different occupations.

FIGURE 1.5

## ENROLLMENT BY PROGRAM CATEGORY




*Source: MUS Warehouse, Summer 2005 to Spring 2016 Enrollment end of term*

## 1.3 Retention and Graduation

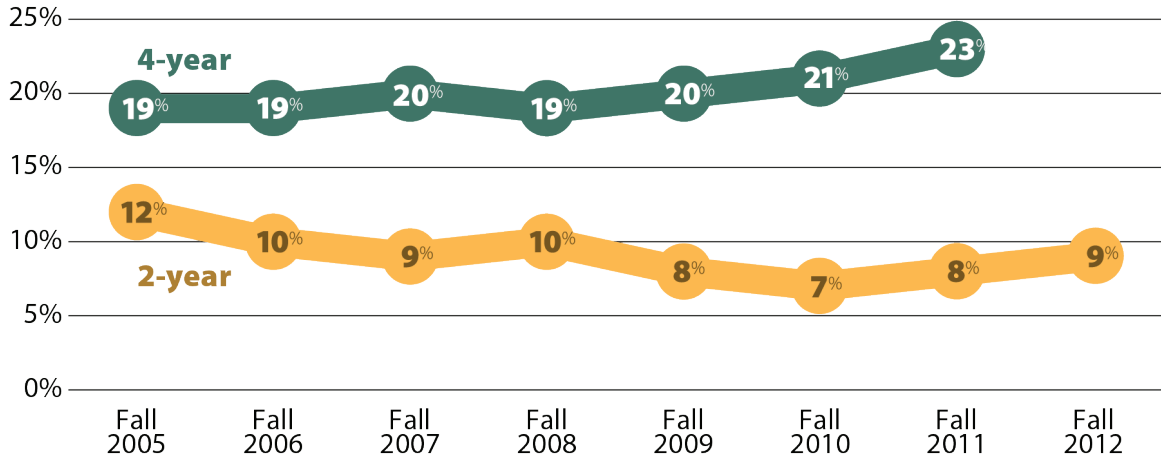
Most college freshman are still enrolled in college the following year. At four-year colleges, retention rates are about 75% over a year, and at two-year colleges the rate falls to about 60%.[8] About 20% of students pursuing a bachelor's degree graduate after four years. Within six years, 48% of students have graduated, and 53% graduate within eight years. Changing majors, taking time off for work or other life events, not declaring a major during freshman year, placement in developmental math or English, financial situation, not passing a required class, spending a semester abroad, or not taking fifteen credits per semester are some of the more common reasons for delayed degree completion.

Students pursuing an associate degree are less likely than bachelor's degree students to graduate. Only 9% of associate degree students graduate within two years of enrollment, and 23% graduate within four years. Two-year college graduation rates have dropped since the recession as a consequence of Montana's strong employment and wage growth, increasing the opportunity costs of educational attainment. Similar to enrollment, two-year college graduation rates are sensitive to changing economic conditions. **Figure 1.6** shows graduation rates at two-year and four-year colleges from 2005 to 2011 for students who graduate within the expected time frame.

8 *Retention rates are calculated as the percentage of first-time, full-time freshman who enter in a given fall semester and are retained through the fall semester of the following year. Individuals are counted as being retained if they attend any MUS institution in the following year.*

FIGURE 1.6

## GRADUATION RATES WITHIN EXPECTED TIMEFRAME BY COLLEGE TYPE

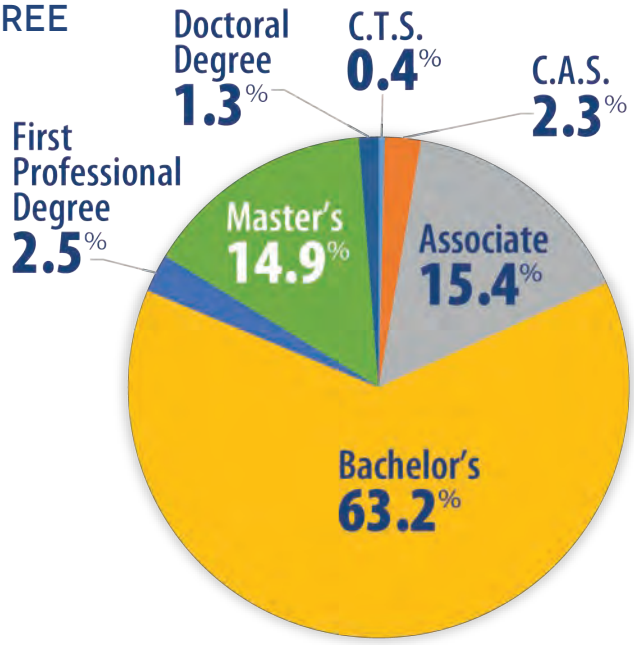



*Source: MUS Warehouse, Fall 2005 to Spring 2015 Enrollment end of term and Awards. Expected completion time frame for two-year college students is two years, and four years for four-year students.*

Among those who graduate, a bachelor's degree is the most common degree earned from Montana colleges. Sixty-three percent of graduates from Montana colleges hold a bachelor's degree. Most of these individuals have not earned any other degree in the state. The next most common degree types are master's and associate degrees, each representing another 15% of graduates. **Figure 1.7** shows the educational attainment of Montana college graduates since 2001.

FIGURE 1.7

## HIGHEST DEGREE

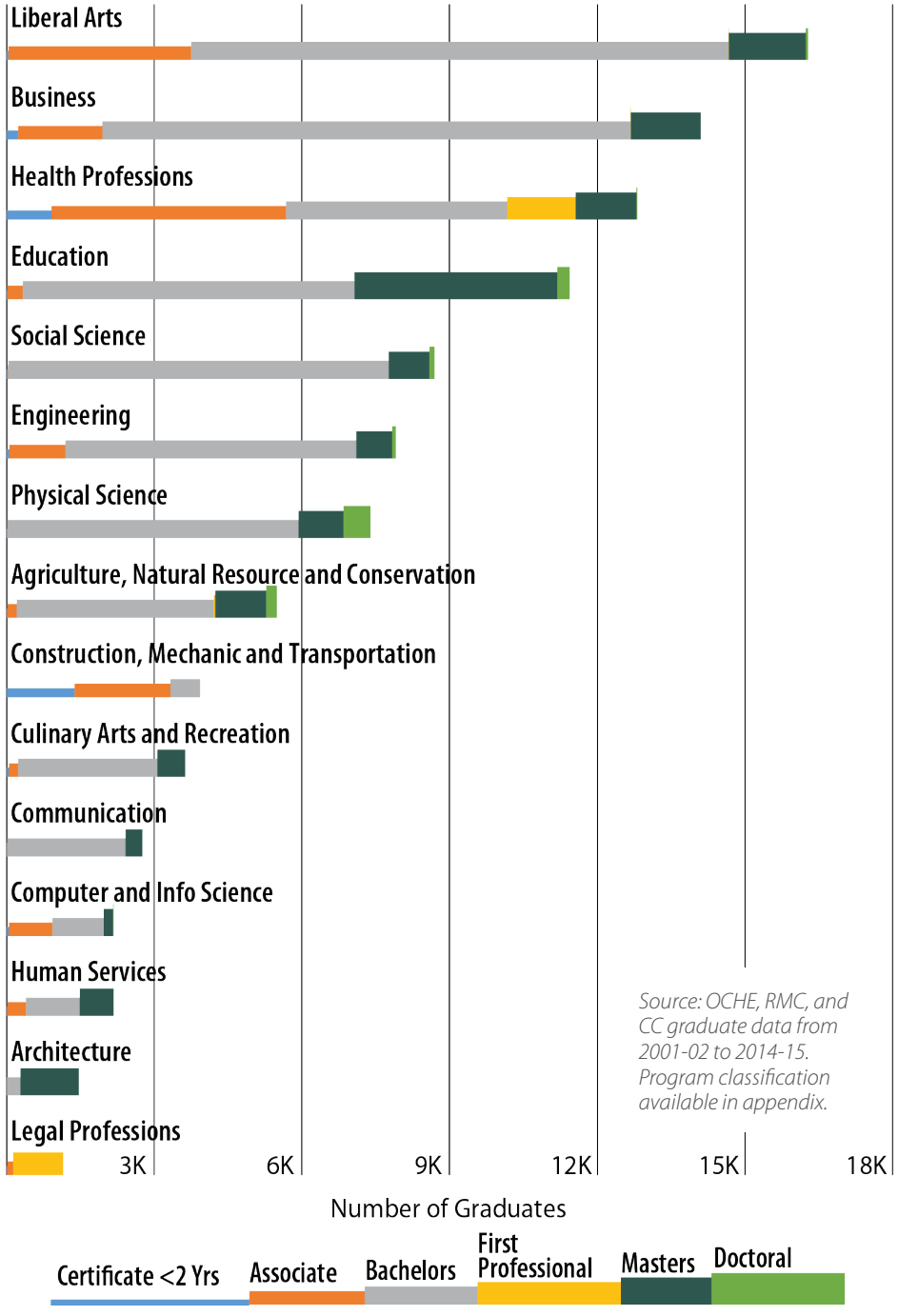



*Source: OCHE, RMC, and CC graduate data from 2001-02 to 2014-15. CTS (<1 yr) = Certificate of Technical Studies, CAS (>1<2 yrs) = Certificate of Applied Science*

Educational attainment varies depending on the program of study. Among those studying business, a bachelor's degree is the most common. In education and architecture, it is more common to obtain a master's degree. People holding a juris doctorate (which is a first professional degree) dominate legal professions. Liberal arts, health professions, and construction, mechanic and transportation programs have higher rates of associate degree holders than average. **Figure 1.8** shows the educational attainment of Montana graduates by program category. Liberal arts programs are the most common among Montana graduates, followed by business, health professions, and education programs.

FIGURE 1.8

## EDUCATION ATTAINMENT BY PROGRAM CATEGORY

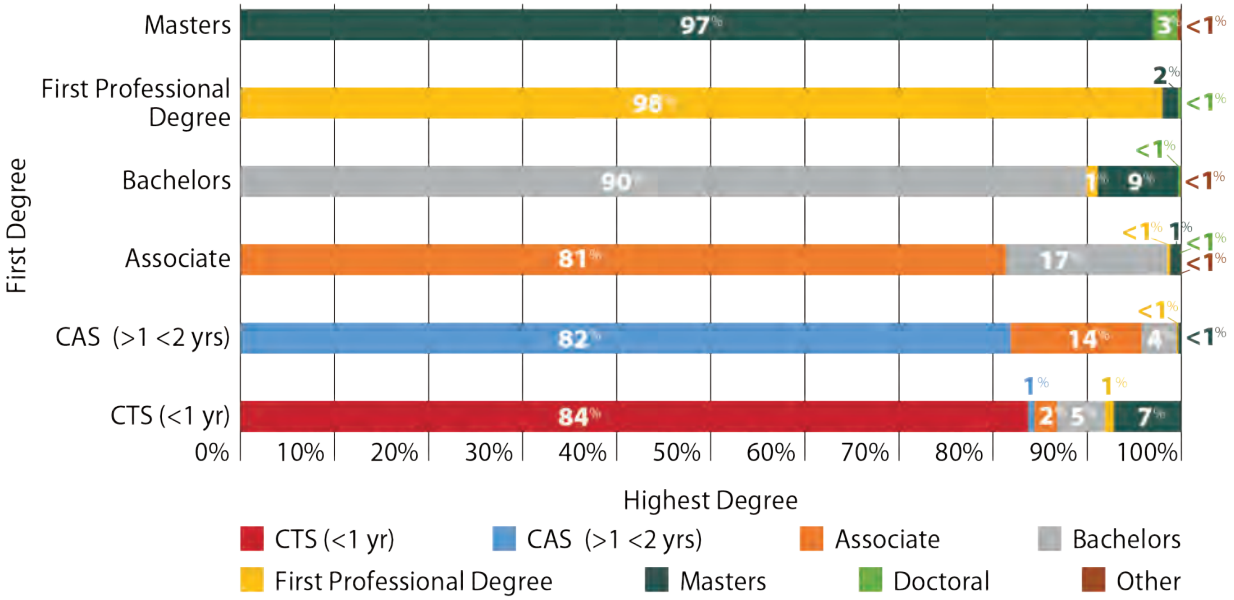


## 1.4 Academic Progression of Graduates in Montana

Some graduates choose to continue their education instead of entering the workforce directly after graduation. About 11% of graduates have obtained more than one degree from a Montana college since 2001. **Figure 1.9** shows the academic progression of graduates from Montana colleges. Most graduates have only earned one degree from Montana; therefore, their first degree is also their highest degree.

FIGURE 1.9

### ACADEMIC PROGRESSION OF GRADUATES



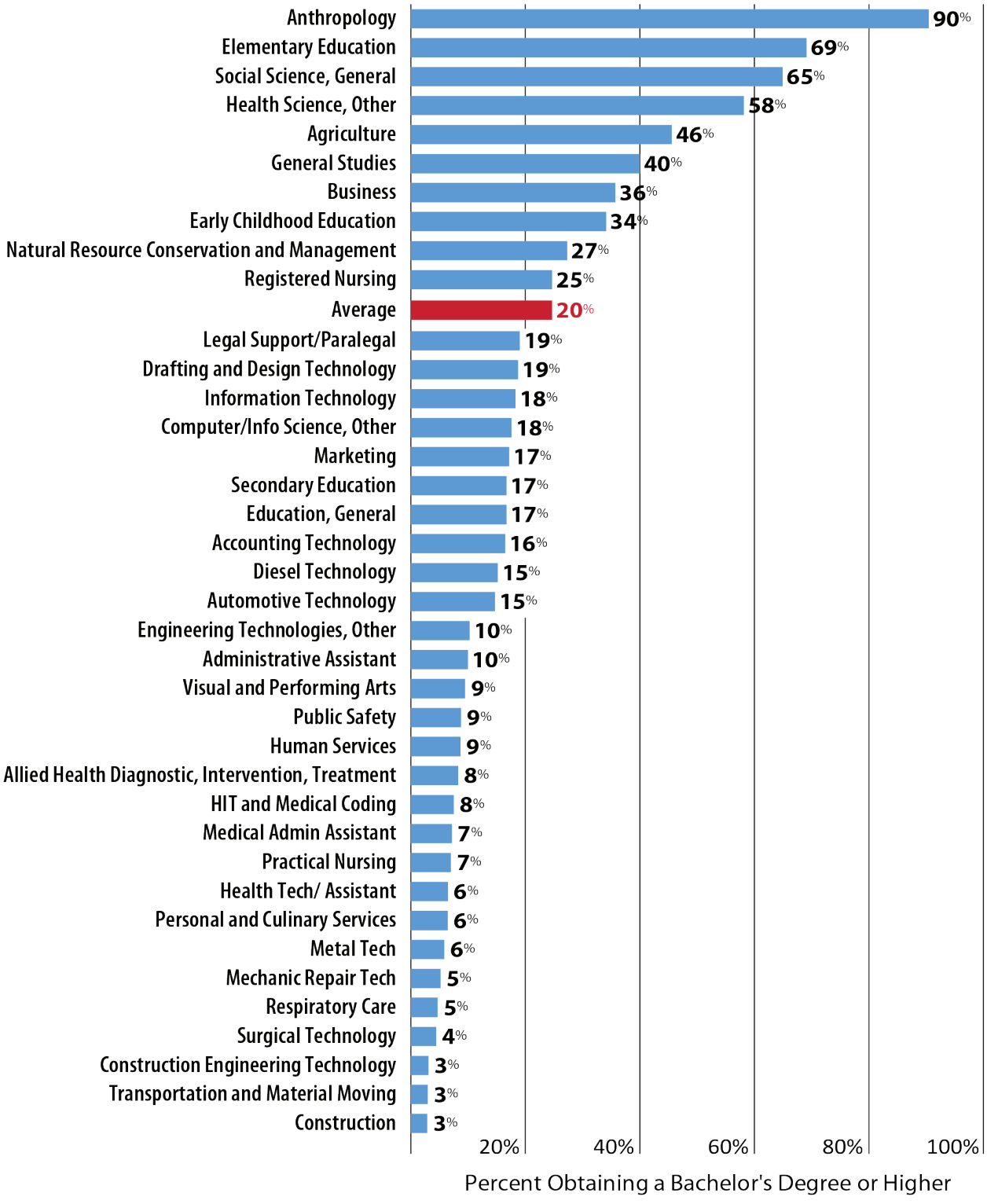

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match, excluding graduates after 2010-11. Data does not include degree earned from colleges not included in this study. CTS (<1 yr) = Certificate of Technical Studies, CAS (>1<2 yrs) = Certificate of Applied Science*

Associate degree graduates have the highest rates of continuing education. About 18% of individuals who earned an associate degree have gone on to obtain a bachelor's degree or higher from a Montana college. The next highest percent of bachelor's degree attainment is with individuals initially obtaining a Certificate of Technical Studies (CTS). About 13% of individuals with a CTS have gone on to obtain a bachelor's degree or higher in Montana. Additionally, there are a number of graduates who earn a CTS at the same time as their bachelor's degree. Including these individuals, 40% of CTS earners hold a bachelor's degree.

Bachelor's degree attainment varies by program. **Figure 1.10** shows the percent of associate degree and certificate earners who obtain a bachelor's degree or higher by program in Montana. Degrees earned from colleges outside the state are not included.

FIGURE 1.10

## BACHELOR'S DEGREE ATTAINMENT OR HIGHER OF ASSOCIATE DEGREE GRADUATES BY PROGRAM




*Source: MTDLI, OCHE, RMC and CC graduate data wage match, excluding graduates after academic year 2010-11. Data only includes degree earned from colleges in this study. Excludes programs with fewer than ten associate degree graduates.*

The general studies program is designed for students to transfer to a four-year institution. As a result, general studies graduates have higher bachelor's degree attainment rates than average. Forty percent of general studies associate degree earners obtain a bachelor's degree from a Montana college. While this percentage is higher than average, it still may not be high enough considering the purpose of a transfer program is to help students transition into a four-year program.

**20% of associate degree graduates earn a bachelor's degree or higher from a Montana college.**

Other associate degree programs with above-average bachelor's degree attainment rates are social science programs, pre-med health science, elementary education, early childhood education, business, agriculture, natural resource and conservation management, and registered nursing. These programs are some of the most popular among graduates, and typical career paths in these programs require a bachelor's or higher.

## SECTION 1 HIGHLIGHTS

- Two-year colleges tend to attract more non-traditional students, age 25 years and older who are from Montana and are interesting in short-term job trainings (**Figures 1.1** and **1.2**).
- Four-year college students are more commonly aged 18 to 24 and come directly from high school. About 33% of university students come from other states (**Figures 1.1** and **1.2**).
- College enrollment has increased by 12% over the last ten years, driven by growth in two-year college enrollment (**Figure 1.4**). However, more students are enrolled in the Montana's universities compared to two-year colleges.
- Liberal arts programs are the most common among college enrollees, followed by healthcare and business programs (**Figure 1.5**).
- Graduation and retention rates at four-year colleges are higher than two-year colleges. 53% of bachelor's degree earners graduate within eight years, compared to 23% of associate degree earners who graduate within four years. Enrollment, retention, and graduation at two-year colleges is much more reactive to changes in the Montana economy.
- 63% of Montana college graduates obtained a bachelor's degree (**Figure 1.7**).
- 20% of associate degree earners continued on to obtain a bachelor's degree in Montana (**Figure 1.9**). General studies, social science, pre-med health professions, education, registered nursing, business, agriculture, and natural resource programs all have above-average bachelor's degree attainment (**Figure 1.10**).

SECTION 2:

# GRADUATE WORKFORCE OUTCOMES

Only data for Montana jobs and graduates from the Montana University System data warehouse, Rocky Mountain College, and Carroll College were available for this analysis. Graduates employed in other states, or studying at other colleges are not included.

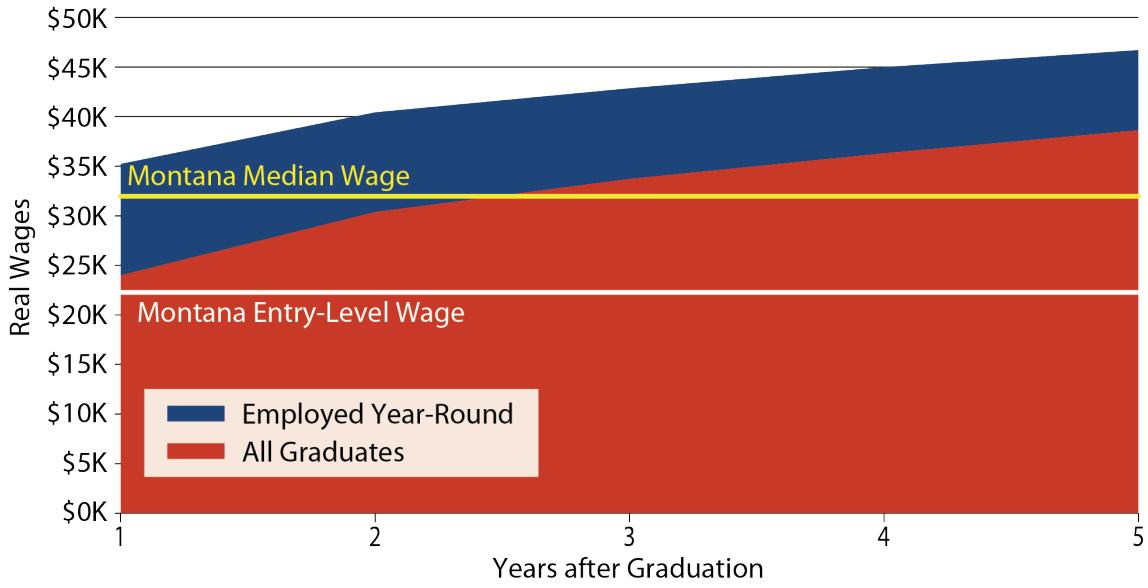
Matching education data from the Office of the Commissioner of Higher Education (OCHE) with the wage data from the Montana Department of Labor & Industry (MTDLI) and income data from the Montana Department of Revenue (DOR) provides insight that goes beyond the few years a student spends at school. This section analyzes workforce outcomes of graduates from Montana's colleges, and how their degree influences their economic success.

## 2.1 Most Graduates Stay in Montana for Work

The majority of graduates from Montana's colleges work in Montana after graduation, thus contributing to the state's economy. Approximately 69% of graduates work in Montana one year after graduation, and 74% of graduates will work in Montana at some point within five years after graduation. Graduates who work in Montana earn wages above the entry-level wage within one year of graduation, and their average wage progresses above the statewide median within three years of graduation. Figures 2.1 depicts the average wage progression of Montana college graduates.

FIGURE 2.1

### REAL AVERAGE WAGE EARNINGS FOR GRADUATES




*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Real wages reported in 2015 dollars using the CPI-U. Median and entry-level wage from 2015 Occupational Employment Statistics.*

Consistent, year-round employment has a large impact on wage earnings. Graduates employed year-round had average wages of over $35,000 one year after graduation, roughly $11,000 more than average for all graduates, and $3,000 above the statewide median wage. The increase in wages for the consistently employed compared to the average graduate is certainly due to hours worked, but data is not available to determine if the consistently employed also achieve a higher hourly wage.

**69%** of Montana graduates work in Montana a year after graduation. Graduates working year-round made **$35,000** one year after graduation, which is above the statewide median wage.

Wages are the primary source of income for most graduates; however, they are not the only source of income. One year after graduation, the average wage of graduates was approximately $24,000, yet graduates reported an average of $30,000 in earned income.[9] Business, rental, or farm income are other sources of income for graduates. While wage income remains the primary source of income for most graduates, income sources tend to diversify as the graduate ages. **Figure 2.2** summarizes the workforce outcomes for graduates from Montana colleges. It is important to note that wage and income presented in **Figure 2.2** represent total earnings.

FIGURE 2.2

## WORKFORCE OUTCOME FOR MONTANA COLLEGE GRADUATES AFTER GRADUATION

| | 1 Year | 2 Year | 3 Year | 4 Year | 5 Year |
|---|---|---|---|---|---|
| Employed in Montana | 69% | 59% | 55% | 52% | 50% |
| Avg Real Wages (All Graduates) | $23,974 | $30,382 | $33,714 | $36,304 | $38,621 |
| Real Wage Growth (All Graduates) | -- | 27% | 11% | 8% | 6% |
| Avg Real Wages (Year-Round Employee) | $35,211 | $40,425 | $42,866 | $44,984 | $46,720 |
| Filing Montana Tax Return | 69% | NA | 61% | NA | 58% |
| Avg Real Income (All Graduates) | $29,879 | NA | $35,007 | NA | $39,992 |

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Real income and wages reported in 2015 dollars using the CPI-U. NA = Not Available.*

Half of graduates still work in Montana five years after graduation. Another 8% of graduates do not work for a Montana employer, but still earn income in Montana, possibly from self-employment. The drop-off from 69% to 58% of graduates with income in the five-year timeframe is expected as more graduates move out of state or drop out of the labor force to have a family, go back to school or make other life decisions.

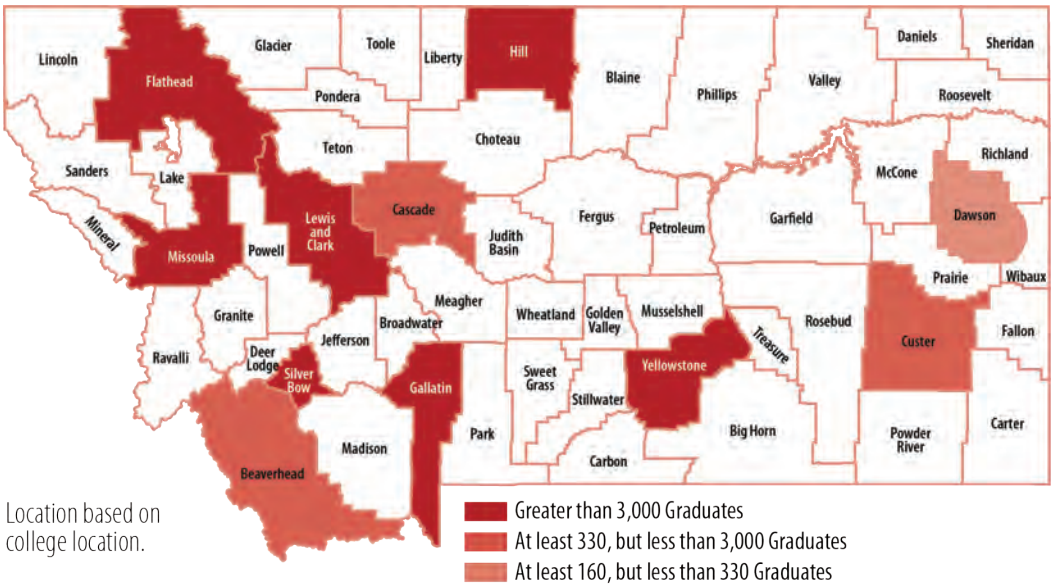
Graduates' contribution to the Montana workforce is felt across the entire state. One year after graduation, Montana college graduates were working in every county in the state. Graduates disperse from the more populated areas (where the colleges are located) to every corner of Montana. **Figures 2.3** and **2.4** demonstrate this migration. **Figure 2.3** shows where the graduates are located during school, and **Figure 2.4** shows their location one year after graduation.

**There are graduates working in every county in Montana.**

9 *Earned income is defined as the sum of lines 7, 12, 17, and 18 on Montana's income tax return. It includes wages and business income, but excludes unearned income such as capital gains and social security. More information about the income data used in this report is available in the workforce methodology section in the appendix.*

The migration of graduates post-graduation demonstrates labor force mobility, which leads to better job matches, improves wages, and promotes economic growth. Labor force mobility is particularly important in the early stages of a worker's career as they gain experience and move up the career ladder. Labor force mobility also helps stabilize the economy during downturns. Workers with the flexibility to move can better respond to changes in employment opportunities.

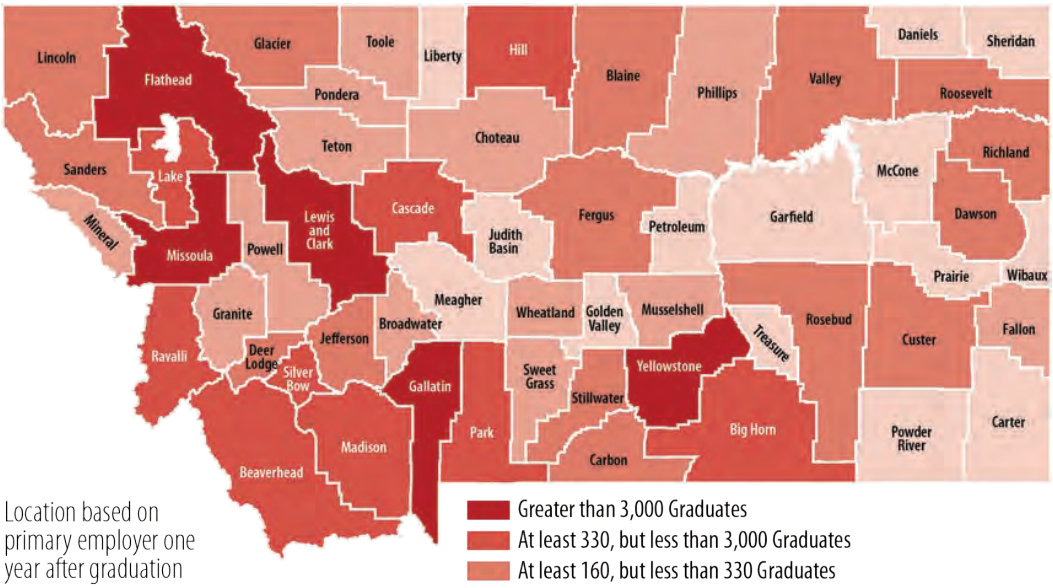
## FIGURE 2.3
## GRADUATES' LOCATION AT GRADUATION BY COUNTY




Location based on college location.

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match*

## FIGURE 2.4
## GRADUATES LOCATION ONE YEAR AFTER GRADUATION BY COUNTY




Location based on primary employer one year after graduation

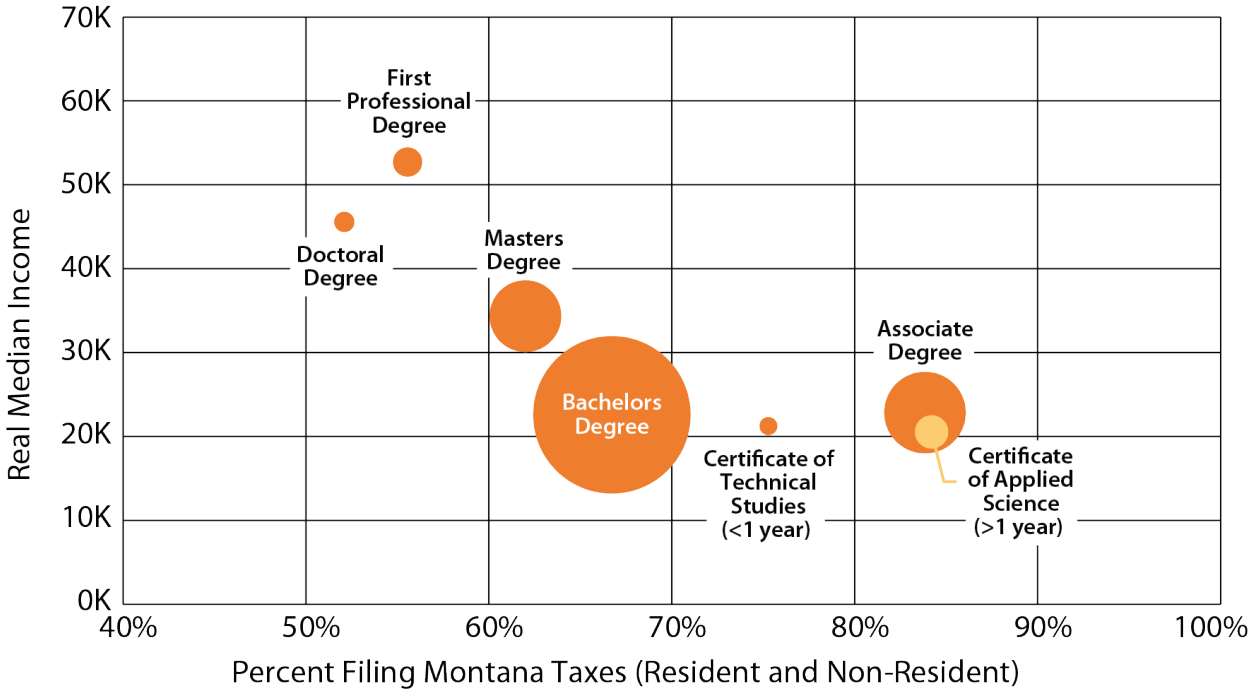
*Source: MTDLI, OCHE, RMC, and CC graduate data wage match.*

## 2.2 Higher Degrees Lead to Higher Income but Lower Retention Rates

Educational attainment influences graduates' workforce outcomes in Montana, with higher education levels associated with increased income. However, as a graduate's education level rises, it becomes more likely that the graduate will seek work outside Montana. About 84% of associate degree graduates work in Montana a year after graduation, compared to 67% of bachelor's degree earners and 52% of PhD graduates. The negative relationship between remaining in Montana and higher education levels likely arises because individuals with more education pursue higher-wage jobs. Montana's high-wage jobs tend to pay less than high-wage jobs in other states, whereas low-wage jobs pay just as well in Montana as in other states.[10] **Figure 2.5** shows workforce outcomes by degree, where the horizontal axis is the percent filing income taxes one year after graduation, and the vertical axis is median income. The size of the bubble corresponds to the number of graduates in each degree type since 2001.

FIGURE 2.5

### WORKFORCE OUTCOMES ONE YEAR AFTER GRADUATION BY DEGREE TYPE




*Source: DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Income is defined as lines 7, 12, 17, and 18 on the MT income tax return. Multiple degree holders are counted once for each degree. Real income reported in 2015 dollars using the CPI-U.*

10 *Wagner, Barbara. 2015. "Montana's Growing Wages: Income and Wages are Gaining Ground on National Average" Montana Economy at a Glance, published by MTDLI, May 2015. Available at lmi.mt.gov.*

The largest drop in graduate retention occurs between an associate and bachelor's degrees. Shorter training times for associate degrees and stronger connections between two-year colleges and local labor markets result in greater retention of associate degree graduates in Montana. The lower retention rates among bachelor's degree earners is reflective of a more mobile workforce. Graduates from four-year colleges tend to be young adults, and are more likely to have moved to Montana from other states for college. Bachelor's graduates are more likely to leave Montana in pursuit of a job offering the highest wages that best matches their skill set and career interests, or to pursue greater experiences.

That being said, the state does not lose workers through the four-year college system. The universities are able to attract people from around the country to attend college in Montana. Thirty-three percent of students at four-year colleges come from out-of-state. Many of these people come to see if Montana is a state where they would like to live. However, most of these "experimental movers" return to their home state.[11] The percentage of four-year students who are Montana residents is the same as the percentage employed in Montana one year after graduation, suggesting the four-year education system comes out even recruiting new people to Montana and retaining the existing workforce.

Bachelor's degree earners report about $22,500 in median income one year after graduation, slightly less than associate degree holders. While no income premium exists for bachelor's degree attainment at the median upon graduation, bachelor's degree earners do have faster wage growth over time. After five years, median income for bachelor's degree holders is $33,000, compared to $31,700 for associate degree earners. The income premium for bachelor's attainment may continue to increase ten years after graduation; however, data is not yet available to evaluate earnings over a longer timeframe. In addition, bachelor's degree earners appear to have greater income potential than associate degree earners. The average earnings for bachelor's degree earners are higher than associate degree earners after one year, suggesting greater upward spread among bachelor's degrees.

**The four-year education system comes out even recruiting new people to Montana and retaining the existing workforce.**

The returns to bachelor's degree attainment vary widely by program. **Figure 2.6** shows average wage outcomes by program between associate and bachelor's degree earners one and five years after graduation. Programs with the greatest return to bachelor's degree attainment are listed first. Only programs offering both a bachelor's and associate degree are included in **Figure 2.6**.

11 *Kaplan, G. and Schulhofer-Wohl, S. (2017), Understanding the Long-Run Decline in Interstate Migration. International Economic Review, 58: 57–94. doi:10.1111/iere.12209*

FIGURE 2.6

## BACHELOR'S AND ASSOCIATE DEGREE WAGE OUTCOMES BY HIGHEST DEGREE PROGRAM

| Program | Associate Degree | | Bachelor's Degree | | Wage Premium | |
|---|---|---|---|---|---|---|
| | 1 Year | 5 Year | 1 Year | 5 Year | 1 Year | 5 Year |
| Information Technology | $21,480 | $33,559 | $51,136 | $69,928 | $29,656 | $36,370 |
| Construction Engineering Technology | $21,199 | $31,752 | $30,738 | $55,719 | $9,539 | $23,968 |
| HIT and Medical Coding* | $21,533 | $25,559 | $27,543 | $44,773 | $6,010 | $19,215 |
| Accounting | $21,209 | $28,524 | $27,845 | $42,512 | $6,636 | $13,988 |
| Secondary Education | $13,820 | $19,411 | $21,430 | $32,772 | $7,609 | $13,361 |
| Agriculture | $15,875 | $28,530 | $21,106 | $41,402 | $5,231 | $12,872 |
| Early Childhood Education | $18,584 | $21,350 | $25,731 | $34,098 | $7,147 | $12,749 |
| Business | $22,567 | $27,435 | $23,086 | $40,052 | $519 | $12,617 |
| Automotive Technology | $23,334 | $36,132 | $28,376 | $47,543 | $5,042 | $11,410 |
| Elementary Education | $11,433 | $21,556 | $20,075 | $30,623 | $8,642 | $9,067 |
| Health Science, Other | $16,685 | $28,790 | $17,259 | $37,091 | $574 | $8,301 |
| Marketing | $18,858 | $28,142 | $20,141 | $36,000 | $1,283 | $7,858 |
| Human Services | $16,956 | $19,871 | $21,367 | $26,643 | $4,410 | $6,771 |
| General Studies | $16,269 | $27,796 | $23,402 | $34,412 | $7,133 | $6,616 |
| Computer/Info Science, Other | $24,566 | $37,751 | $29,403 | $44,261 | $4,837 | $6,510 |
| Education, General | $19,307 | $24,419 | $17,095 | $30,684 | ($2,212) | $6,265 |
| Drafting and Design Technology | $25,924 | $37,023 | $28,977 | $42,668 | $3,054 | $5,645 |
| Diesel Technology | $27,854 | $39,786 | $32,965 | $45,271 | $5,111 | $5,485 |
| Health Care Office Mgmt | $22,077 | $27,703 | $27,909 | $31,887 | $5,831 | $4,184 |
| Natural Resource Conservation & Mgmt | $13,794 | $21,002 | $14,564 | $24,177 | $770 | $3,175 |
| Health Tech/ Assistant | $34,173 | $43,452 | $22,089 | $46,087 | ($12,084) | $2,636 |
| Transportation & Material Moving* | $20,455 | $32,332 | $16,661 | $34,867 | ($3,793) | $2,535 |
| Registered Nursing | $41,526 | $49,556 | $41,110 | $51,016 | ($442) | $1,460 |
| Visual and Performing Arts | $15,664 | $21,991 | $13,994 | $22,855 | ($1,670) | $864 |
| Engineering Technologies, Other | $29,196 | $50,629 | $32,497 | $49,221 | $3,300 | ($1,408) |
| Public Safety | $23,553 | $42,193 | $23,288 | $35,871 | ($265) | ($6,323) |
| Allied Health Diagnostic, Intervention, Treatment | $32,984 | $45,678 | $16,418 | $30,467 | ($16,567) | ($15,210) |

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Wage outcomes by program only include highest degree. Excludes programs with less than ten graduates working in MT. Real average wages reported in 2015 dollars using the CPI-U.. Allied health program excludes surgical technology and respiratory care. * = Associate Degree column represents wage outcomes for Certificate of Applied Science because it is more common.*

Programs like information technology, construction engineering technology, health information technology (HIT), and education have significantly higher wages in Montana for bachelor's degree attainment. Most of these programs train graduates to work in occupations requiring bachelor's degree. Five years after graduation, information technology graduates holding a bachelor's were making twice as a much as those holding an associate. On the other hand, graduates from associate degree programs in allied health, intervention, and treatment; public safety; and engineering technology made more than bachelor's degree earners in the same field after five years. These programs train graduates to work in occupations that typically do not require a bachelor's degree.

***INFORMATION TECHNOLOGY*** graduates earn twice as much with a bachelor's degree compared to an associate degree. However, there is little wage differences between degree types for ***REGISTERED NURSING*** graduates.

While most programs have significant wage premiums if they train individuals to work in occupations requiring a bachelor's degree, registered nursing is the exception. Most registered nurses enter the field with a Bachelor's of Science in Nursing (BSN), yet BSN registered nurses make only 5% more than registered nurses with an associate degree. Within the nursing profession, education attainment does not correlate strongly with wage premiums, unless that increased education results in a more advanced nursing license.[12] Associate and bachelor's trained registered nurses hold the same nursing license, and therefore their wages do not differ significantly.

As shown in **Figure 2.5**, graduate degree earners have substantially higher income levels a year after graduation than bachelor's degree earners. Master's degree earners report $13,000 more in median income than bachelor's degree earners, with little drop in graduate retention between the two degree types. The largest income difference occurs between a master's degree and a first professional degree. Graduates earning a first professional degree, which primarily consists of Doctorates in Physical Therapy and Juris Doctorate degrees, earn $20,000 more at the median than master's degree earners a year after graduation.

Returns to graduate degree attainment vary by program. **Figure 2.7** shows the difference in wages one and five years after graduation for bachelor's and master's degree earners by program. Graduates in healthcare office management, forestry, and chemistry programs have approximately twice the wage earnings of graduates obtaining a bachelor's degree in the same program. There are only a few programs where achieving a graduate degree does not result in higher wages on average. Those programs are film, writing, journalism, pharmacy, and political science. Although graduates with higher degrees in these programs may have higher wages initially, the wage premium disappears over time.

*12 Watson et al. 2016. "The Status of the Nursing Workforce in Montana." published by the Montana Department of Labor & Industry. Available at lmi.mt.gov.*

FIGURE 2.7

## BACHELOR'S DEGREE AND HIGHER WAGE OUTCOMES BY HIGHEST DEGREE PROGRAM

| Program | Bachelor's | | Master's or Higher | | Wage Premium | |
|---|---|---|---|---|---|---|
| | 1 Year | 5 Years | 1 Year | 5 Years | 1 Year | 5 Year |
| Health Care Office Management | $27,909 | $31,887 | $78,026 | $107,418 | $50,117 | $75,531 |
| Engineering, General | $31,173 | $58,688 | $74,472 | $103,430 | $43,299 | $44,742 |
| Chemistry* | $15,797 | $32,896 | $32,822 | $64,327 | $17,025 | $31,431 |
| Forestry* | $16,705 | $25,943 | $34,623 | $57,280 | $17,917 | $31,338 |
| Business | $23,086 | $40,052 | $48,648 | $69,062 | $25,562 | $29,010 |
| General Studies* | $23,402 | $34,412 | $41,181 | $61,195 | $17,779 | $26,783 |
| Registered Nursing | $41,110 | $51,016 | $56,033 | $76,966 | $14,923 | $25,950 |
| Computer Science | $32,583 | $53,702 | $47,767 | $75,268 | $15,184 | $21,566 |
| Education, General | $17,095 | $30,684 | $42,149 | $51,061 | $25,054 | $20,377 |
| Animal Science | $16,908 | $29,158 | $23,543 | $48,989 | $6,635 | $19,831 |
| Engineering Technologies, Other | $32,497 | $49,221 | $46,993 | $67,964 | $14,496 | $18,743 |
| Geology | $16,746 | $32,886 | $26,385 | $50,973 | $9,639 | $18,087 |
| Civil Engineering | $32,301 | $52,437 | $39,609 | $69,882 | $7,308 | $17,444 |
| Industrial Engineering | $18,841 | $48,320 | $37,312 | $65,303 | $18,472 | $16,983 |
| Foreign Languages and Literatures | $14,323 | $27,036 | $17,024 | $43,890 | $2,701 | $16,854 |
| Visual and Performing Arts | $13,994 | $22,855 | $26,258 | $39,683 | $12,264 | $16,829 |
| Philosophy/Theology | $13,050 | $24,675 | $16,044 | $40,183 | $2,994 | $15,507 |
| Environmental Engineering | $24,508 | $49,971 | $39,514 | $65,281 | $15,006 | $15,310 |
| Secondary Education | $21,430 | $32,772 | $41,402 | $47,272 | $19,973 | $14,500 |
| Special Education | $21,979 | $31,424 | $41,139 | $45,557 | $19,160 | $14,134 |
| Public Administration | $25,227 | $36,824 | $35,923 | $50,699 | $10,696 | $13,875 |
| Phyiscal Science, Other* | $15,254 | $33,582 | $21,650 | $47,352 | $6,397 | $13,771 |
| Fish and Wildlife Management | $14,331 | $23,392 | $20,568 | $36,822 | $6,237 | $13,430 |
| Geography | $14,989 | $29,300 | $29,784 | $42,593 | $14,795 | $13,293 |
| Physics** | $14,505 | $35,507 | $20,219 | $48,020 | $5,714 | $12,513 |
| Linguistics | $11,684 | $18,943 | $11,648 | $31,179 | ($36) | $12,236 |
| Mechanical Engineering | $24,560 | $53,827 | $34,603 | $65,199 | $10,043 | $11,372 |
| Mathematics/Stats | $18,297 | $36,251 | $28,040 | $47,223 | $9,743 | $10,973 |
| Physician Assistant | $27,399 | $81,123 | $38,470 | $91,097 | $11,071 | $9,974 |

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Wages by program only include highest degree. Excludes programs with less than ten graduates working in MT. Real average wages reported in 2015 dollars using the CPI-U.*
** = Highest degree is First Professional or Doctoral Degree.*
***= Doctoral degree is highest degree, and wages are 3-years instead of 5-years after graduation for highest degree.*

FIGURE 2.7 (CONTINUED)

## BACHELOR'S DEGREE AND HIGHER WAGE OUTCOMES BY HIGHEST DEGREE PROGRAM

| Program | Bachelor's | | Master's or Higher | | Wage Premium | |
|---|---|---|---|---|---|---|
| | 1 Year | 5 Years | 1 Year | 5 Years | 1 Year | 5 Year |
| Health and P.E./Fitness, General | $16,248 | $30,958 | $24,664 | $40,791 | $8,416 | $9,833 |
| Social Work | $19,648 | $29,332 | $30,989 | $38,743 | $11,341 | $9,411 |
| Accounting | $27,845 | $42,512 | $29,467 | $51,900 | $1,622 | $9,387 |
| Electrical and Electronics Engineering | $31,231 | $59,014 | $37,208 | $68,214 | $5,977 | $9,200 |
| Early Childhood Education | $25,731 | $34,098 | $35,873 | $43,073 | $10,142 | $8,975 |
| Public Relations | $20,401 | $37,609 | $36,334 | $46,200 | $15,933 | $8,591 |
| Environmental Science | $15,376 | $27,520 | $21,085 | $35,762 | $5,709 | $8,241 |
| Health Science, Other | $17,259 | $37,091 | $34,876 | $45,124 | $17,617 | $8,033 |
| Sociology | $18,841 | $30,701 | $22,930 | $37,948 | $4,089 | $7,247 |
| Economics | $18,272 | $35,025 | $31,527 | $41,133 | $13,255 | $6,108 |
| History | $15,200 | $27,322 | $18,258 | $33,106 | $3,058 | $5,784 |
| Natural Resource Conservation and Management | $14,564 | $24,177 | $22,229 | $29,825 | $7,665 | $5,648 |
| Music | $16,335 | $24,043 | $19,158 | $28,945 | $2,823 | $4,902 |
| Psychology | $16,331 | $28,656 | $17,815 | $33,380 | $1,484 | $4,724 |
| Anthropology | $13,548 | $24,252 | $16,286 | $27,580 | $2,738 | $3,329 |
| Kinesiology and Exercise Science | $16,074 | $29,740 | $24,716 | $32,422 | $8,642 | $2,682 |
| Biology, General | $15,196 | $31,901 | $21,423 | $34,527 | $6,227 | $2,626 |
| English | $14,870 | $25,077 | $20,662 | $27,393 | $5,792 | $2,316 |
| Communication Studies | $17,588 | $29,406 | $15,465 | $30,086 | ($2,123) | $680 |
| Plant Science | $17,885 | $29,072 | $20,091 | $29,541 | $2,207 | $469 |
| Writing | $17,428 | $31,207 | $15,974 | $31,347 | ($1,453) | $141 |
| Pharmacy* | $62,942 | $103,546 | $69,076 | $103,362 | $6,134 | ($184) |
| Journalism | $15,002 | $25,649 | $17,156 | $25,220 | $2,154 | ($429) |
| Cinematography and Film | $13,237 | $22,947 | $21,928 | $17,359 | $8,691 | ($5,589) |
| Political Science | $15,025 | $31,335 | $16,872 | $25,079 | $1,848 | ($6,256) |

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Wages by program only include highest degree. Excludes programs with less than ten graduates working in MT. Real average wages reported in 2015 dollars using the CPI-U.*
** = Highest degree is First Professional or Doctoral Degree.*
***= Doctoral degree is highest degree, and wages are 3-years instead of 5-years after graduation for highest degree.*

Registered nursing graduates experience a much larger wage premium between a master's and bachelor's degree than between an associate and bachelor's degree. Master's degree nurses typically hold an Advanced Practice Registered Nursing (APRN) license. APRN licensees have a broader scope of practice than registered nurses licenses. As a result, nurses holding a master's degree earn 50% more than bachelor-trained nurses on average.

Business graduates also earn more by achieving a Master of Business (MBA) than a bachelor's degree. The wage premium between an associate and bachelor's degree in business is only 39% after five years, compared to a 72% between a bachelor's and master's degree.

## 2.3 Success of Short-Term Degrees in the Montana Workforce

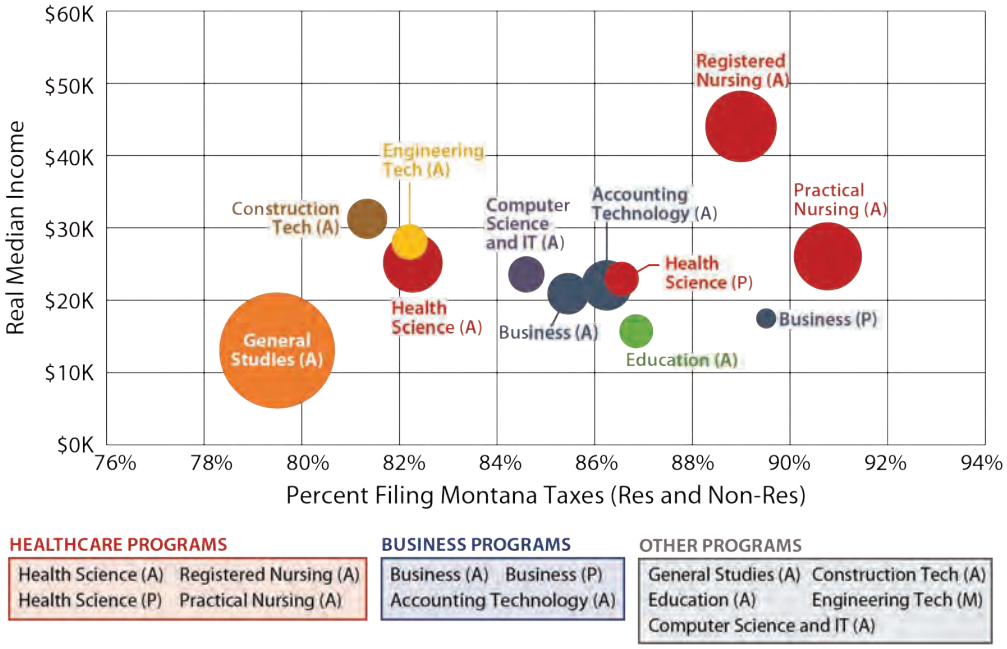
Graduates from two-year colleges have quicker training times, lower tuition costs, and greater retention in the Montana labor market compared to four-year colleges. However, workforce outcomes vary by program. Understanding which programs lead to the best workforce outcomes can help students pursuing a short-term degree (less than four years) maximize their returns to education.

### 2.3.1 High-Income Careers Requiring less than a Bachelor's

There are a number of associate and certificate programs with above-average wage earnings. **Figure 2.8** shows the workforce outcomes for associate degrees and postsecondary award programs. The horizontal axis is the percent of graduates filing income taxes one year after graduation, and the vertical axis is their reported median income. The size of the bubble corresponds to the number of graduates in each program since 2001. The programs are colored based on their program categories. Programs in the upper-right hand corner have better workforce outcomes than programs in the lower-left corner.

FIGURE 2.8

WORKFORCE OUTCOMES ONE YEAR AFTER GRADUATION FOR DEGREES LESS THAN A BACHELOR'S BY PROGRAM




*Source: DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Income is defined as lines 7, 12, 17, and 18 on the Montana income tax return, not including farm income. Real average wages reported in 2015 dollars using the CPI-U. Only programs with at least ten graduates per year are included. (A) = Associate Degree (P) =Postsecondary non-degree award*

Health professions programs, colored red, have the best workforce outcomes among short-term degrees. Registered nursing associate degree earners had median income of roughly $44,000 in the first year after graduation. This median income level is only $2,000 less than registered nurses with a bachelor's degree, and is more than the median earnings of many other bachelor's degree programs. Practical nursing graduates earn about $18,000 less than registered nurses, but have higher retention rates. Ninety-one percent of associate practical nursing graduates work in Montana a year after graduation, compared to 89% of associate degree registered nurses.

Associate degree programs with **higher median incomes** than bachelor's degree programs a year after graduation:

- Health Professions
- Construction Technology
- Engineering
- Computer Science and IT

Construction technology graduates earn the next highest income after registered nurses. Construction technology graduates holding an associate degree reported $31,000 in median income one year after graduation, only $8,000 less than bachelor's degree holders in that field, and more than bachelor's degree earners in other fields. Engineering graduates had the next highest median wage of $28,000 one year after graduation, followed by practical nurses at $26,000. Median incomes reported for health professions, construction technology, engineering, and computer and IT associate degrees are higher than the median income reported across all bachelor degree programs a year after graduation.

Business, general studies, and education programs report lower median incomes than the median across all associate degree programs. General studies is the most common program among associate degree graduates, and has the lowest workforce outcomes among shorter-term degrees. The general studies program is designed for students who are unsure of their career interests and are looking to transfer to a four-year college. Forty percent of associate degree graduates in general studies obtain a bachelor's degree, which is above-average but perhaps not high enough considering the purpose of the program. Business graduates with an associate degree are only 4% less likely to achieve a bachelor's degree than general studies graduates, but they earn $7,000 more a year after graduation, and are 6% more likely to work in Montana after graduation. Perhaps students who are unsure of their career interest could be guided towards a business degree instead of general studies to better maximize their earning potential.

## 2.3.2 Tuition Cost Recovery

For students looking to maximize the returns to their education, understanding future earnings is only one part of the equation. Tuition costs are also important considerations. **Figure 2.9** and 2.10 show the break even periods for associate degree and post-secondary certificate earners by program. The break even period is calculated as the number of months it takes the average graduate to earn wage equal to the estimated amount spent on tuition.[13] High-wage programs tend to have shorter break even periods than programs with lower wages. However, all associate and certificate programs have break even periods less than one year.

Associate and certificate earners recover the costs of tuition **within a year** of graduation.

13 *Costs based on average in-state tuition per semester at two-year colleges in Montana, and average time to completion for each program provided by OCHE.*

FIGURE 2.9

## BREAK EVEN ANALYSIS FOR CERTIFICATE EARNERS BY PROGRAM

| Certificate | Program | Tuition Cost | Break even Months | Avg Wage 1YR After Grad |
|---|---|---|---|---|
| Certificate of Technical Studies < 1YR | **Average, All Programs** | **$8,322** | **5.3** | **$22,538** |
| | Construction | $5,539 | 2.3 | $28,606 |
| | Health Tech/ Assistant | $12,339 | 9.3 | $15,977 |
| | Medical Admin Assistant | $11,332 | 9.5 | $14,327 |
| Certificate of Applied Science >1 <2 YR | **Average, All Programs** | **$6,773** | **4.3** | **$20,201** |
| | Transportation & Material Moving | $4,035 | 2.4 | $19,801 |
| | Public Safety | $5,665 | 2.5 | $27,429 |
| | Diesel Technology | $5,382 | 2.7 | $23,506 |
| | Construction | $4,445 | 3.2 | $16,734 |
| | Automotive Technology | $5,228 | 3.4 | $18,238 |
| | Metal Tech | $6,253 | 3.4 | $21,802 |
| | Mechanic Repair Tech | $5,264 | 3.6 | $17,786 |
| | Drafting and Design Technology | $11,108 | 5.1 | $26,126 |
| | Accounting Technology | $8,973 | 5.5 | $19,693 |
| | HIT and Medical Coding | $9,805 | 5.5 | $21,470 |
| | Engineering Technologies, Other | $6,867 | 5.7 | $14,486 |
| | Practical Nursing | $10,851 | 6.0 | $21,783 |
| | Business | $11,369 | 6.0 | $22,733 |
| | Health Tech/ Assistant | $9,531 | 6.1 | $18,842 |
| | Personal and Culinary Services | $8,493 | 6.3 | $16,252 |
| | Legal Support/Paralegal | $8,983 | 6.3 | $17,037 |
| | Computer/Info Science, Other | $10,001 | 6.4 | $18,628 |
| | Visual and Performing Arts | $8,436 | 6.7 | $15,084 |
| | Administrative Assistant | $10,556 | 7.6 | $16,635 |
| | Medical Admin Assistant | $10,470 | 7.7 | $16,281 |
| | Marketing | $14,725 | 12.6 | $13,813 |

*Source: MUS Warehouse. Costs based on average in-state tuition per semester at two-year colleges in Montana, and average time to completion. RMC and CC data not included. Student loan information not included. Real average wages reported in 2015 dollars using the CPI-U.*

The shortest break even periods among certificate earners include construction, mechanic, and transportation programs, allowing graduates who work in Montana to recover their tuition costs within a few months. These programs have estimated average tuition costs of less than $10,000 and average wages of between $16,700 and $28,600 for graduates working in Montana. Graduates with a Certificate of Technical Studies (CTS) in construction spend an average of $5,500 on tuition and make $28,600 in wages a year after graduating, which is the highest wage among certificate earners.

Additional associate degree programs with short break even periods include construction, mechanic, transportation, public safety, and registered nursing programs. These programs have higher wages than average, and may be good candidates for students with limited resources who want to minimize their time out of the workforce. Education, business, and liberal arts programs have the longest break even periods among associate degrees, which is mostly due to the programs below-average wage earnings.

FIGURE 2.10

## BREAK EVEN ANALYSIS FOR ASSOCIATE DEGREE EARNERS BY PROGRAM

| Program | Tuition Cost | Break even Months | Avg Wage 1Yr After Grad |
|---|---|---|---|
| **Average, All Programs** | **$11,094** | **7.2** | **$24,558** |
| Diesel Technology | $7,498 | 3.3 | $27,343 |
| Engineering Technologies, Other | $8,510 | 3.6 | $28,267 |
| Metal Tech | $7,469 | 3.7 | $24,419 |
| Mechanic Repair Tech | $6,854 | 3.8 | $21,560 |
| Public Safety | $7,577 | 3.9 | $23,444 |
| Registered Nursing | $13,963 | 4.2 | $40,321 |
| Automotive Technology | $8,469 | 4.5 | $22,351 |
| Allied Health Diagnostic, Intervention, Treatment | $12,883 | 4.7 | $33,171 |
| Construction | $8,105 | 4.7 | $20,821 |
| Respiratory Care | $12,799 | 4.8 | $32,324 |
| Drafting and Design Technology | $10,905 | 5.1 | $25,480 |
| Construction Engineering Technology | $8,729 | 5.2 | $20,187 |
| Health Tech/ Assistant | $15,465 | 5.4 | $34,516 |
| Surgical Technology | $14,313 | 5.6 | $30,429 |
| Elementary Education | $5,539 | 5.7 | $11,572 |
| Information Technology | $10,346 | 6.0 | $20,791 |
| Computer/Info Science, Other | $12,106 | 6.0 | $24,216 |
| Practical Nursing | $11,841 | 6.0 | $23,536 |
| Business | $11,424 | 6.4 | $21,511 |
| Accounting Technology | $11,270 | 6.4 | $21,059 |
| Legal Support/Paralegal | $10,989 | 6.4 | $20,486 |
| Agriculture | $10,369 | 6.6 | $18,809 |
| Personal and Culinary Services | $9,031 | 6.7 | $16,192 |
| Health Care Office Management | $12,647 | 7.0 | $21,818 |
| Administrative Assistant | $11,579 | 7.4 | $18,773 |
| Education, General | $12,084 | 7.4 | $19,531 |
| Medical Admin Assistant | $12,540 | 7.6 | $19,891 |
| HIT and Medical Coding | $12,140 | 7.8 | $18,627 |
| Marketing | $12,275 | 8.3 | $17,649 |
| Visual and Performing Arts | $11,200 | 8.6 | $15,644 |
| Health Science, Other | $14,981 | 9.7 | $18,589 |
| General Studies | $11,903 | 9.8 | $14,529 |
| Transportation and Material Moving | $13,233 | 10.4 | $15,260 |
| Early Childhood Education | $17,026 | 10.7 | $19,047 |
| Secondary Education | $12,116 | 11.6 | $12,484 |

*Source: MUS Warehouse. Costs based on average in-state tuition per semester at two-year colleges in Montana, and average time to completion. RMC and CC data not included. Student loan information not included. Real average wages reported in 2015 dollars using the CPI-U.*

## 2.4 Bachelor's Graduates in the Montana Workforce

Despite increasing enrollment at two-year colleges, four-year universities remain the more popular choice among Montana college students. The state's two flagship universities produce the most graduates, primarily in the fields of liberal arts, health professions, and business. These graduates are drawn to Montana from a variety of different states in pursuit of a high-quality education. After graduation, some return to their home state, while others remain in Montana to work. The likelihood of a graduate staying in Montana for work varies depending on their program of study. Four-year college graduates' earnings also vary by program. Analyzing workforce outcomes by program helps students understand their earnings potential, and allows them to make informed decisions about investing in their education.

### 2.4.1 Bachelor's Degree Programs with the Best Workforce Outcomes

Most graduates from Montana's colleges hold a bachelor's degree. At the median, bachelor's degree graduates did not report significantly higher earnings than associate degree earners. However, students who pursued careers in engineering, health professions, business, computer and information science, and construction technology reported higher income levels than the median. Students who would like to pursue a bachelor's degree may consider those programs of study to maximize their earning potential in the state. **Figure 2.11** shows the median income of bachelor's degree earners by program for those filing income tax returns in Montana a year after graduation. Metrics that fall above the median are colored green.

Bachelor's degree programs with **income of at least $30,000:**

- Engineering
- Registered Nursing
- Health Science
- Computer & Info Science
- Construction Technology

FIGURE 2.11

### WORKFORCE OUTCOMES ONE YEAR AFTER GRADUATION FOR BACHELOR'S DEGREE BY PROGRAM

| Program Category | Program | % Filing | Median Income |
|---|---|---|---|
| Ag, Natural Resource & Conservation | Animal Science | 78% | $ 18,630 |
| | Forestry and Wildlife Management | 64% | $ 26,417 |
| Architecture | Architecture | 62% | $ 14,540 |
| Business | Business | 69% | $ 26,029 |
| | Accounting and Finance | 77% | $ 28,541 |
| Communication | Communication | 58% | $ 21,451 |
| | Journalism and PR | 58% | $ 22,179 |
| Computer and Info Science | Computer Science | 69% | $ 35,788 |
| | Computer/Info Science, Other | 80% | $ 30,447 |
| Culinary Arts & Recreation | Kinesiology and Exercise Science | 70% | $ 19,419 |
| | Health and PE/Fitness, General | 69% | $ 18,114 |

*Source: DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Income is defined as lines 7, 12, 17, and 18 on the MT income tax return, not including farm income. Only programs with at least ten graduates per year are included. Real average wages reported in 2015 dollars using the CPI-U*

FIGURE 2.11 (CONTINUED)

## WORKFORCE OUTCOMES ONE YEAR AFTER GRADUATION FOR BACHELOR'S DEGREE BY PROGRAM

| Program Category | Program | % Filing | Median Income |
|---|---|---|---|
| Construction, Mechanic & Transportation | Construction Technology | 55% | $ 39,199 |
| Education | Elementary Education | 79% | $ 21,482 |
| | Special Education | 78% | $ 24,678 |
| Engineering | Engineering, Other | 32% | $ 41,348 |
| | Engineering Technologies, Other | 62% | $ 40,708 |
| | Civil Engineering | 66% | $ 41,140 |
| | Engineering, General | 56% | $ 45,143 |
| | Electrical & Electronics Engineering | 59% | $ 42,095 |
| Health Professions | Registered Nursing | 80% | $ 46,004 |
| | Health Science | 62% | $ 40,164 |
| Human Services | Human Services | 76% | $ 23,025 |
| Liberal Arts | General Studies | 67% | $ 23,148 |
| | English and Writing | 64% | $ 16,632 |
| | History | 63% | $ 18,664 |
| | Visual and Performing Arts | 60% | $ 16,336 |
| | Language and Linguistics | 59% | $ 17,022 |
| Physical Science | Biology | 66% | $ 18,187 |
| | Environmental Science | 64% | $ 19,401 |
| | Physical Science, Other | 58% | $ 19,586 |
| | Geology | 65% | $ 22,132 |
| | Microbiology | 71% | $ 22,153 |
| Social Science | Social Science, Other | 67% | $ 18,519 |
| | Sociology | 68% | $ 21,704 |
| | Political Science | 61% | $ 19,541 |
| | Anthropology | 61% | $ 17,835 |

*Source: DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Income is defined as lines 7, 12, 17, and 18 on the MT income tax return, not including farm income. Only programs with at least ten graduates per year are included. Real average wages reported in 2015 dollars using the CPI-U*

Registered nurses have the best workforce outcomes among bachelor's degree earners in Montana. Eighty percent of registered nursing graduates stayed in Montana after graduation and earned $46,000 within the year, which is the highest income and retention rate of any bachelor's degree program. Education programs, animal science, and other computer and information science programs also have high retention rates after graduation, but lower income levels.

Graduates in liberal arts, social science, communication, architecture, or physical science have the lowest workforce outcomes compared to other bachelor's degree programs. Graduates from most of these programs reported less than $20,000 in median income a year after graduation. Students who are interested in these fields of study may want to look at utilizing the two-year college system as a way to lower the cost of education, so their future earnings can better justify the cost of education.

## 2.4.2 Bachelor's Degree Tuition Savings for Transfer Students

Cost savings for transfer students are greatest for students pursuing a degree in programs with below-average workforce outcomes – such as liberal arts, communication, and social science.

Students at four-year colleges have higher tuition costs than two-year college students, making bachelor's degree attainment more expensive. However, students can lower their tuition expenses by utilizing the two-year system to fulfill requirements on their path to a bachelor's degree. Students coming directly to a four-year college from high school spend $25,000 in tuition for a bachelor's degree on average, compared to $24,000 for students who transfer from a two-year college.[14] Cost savings for transfer students allow them to recover their tuition costs six months faster than new students. However, the cost savings vary by program. The cost savings are the greatest for students who are interested in programs with below-average workforce outcomes – such as liberal arts, social science, and communication programs. For example, students who transfer from a two-year college to earn a bachelor's in general studies save about $7,000 on average compared to going directly into a bachelor's program.

Programs with above-average wages in the year after graduation, like registered nursing, engineering, and computer science, recover the costs of tuition quickly. Students in these programs spend less on tuition and recover costs faster by going directly to a four-year college from high-school rather than transferring from a two-year college.

**Figure 2.12** shows the break even period for bachelor's degree attainment by program for transfer students and new students who entered the four-year college directly after high school. The break even period measures the number of months it takes graduates to earn wages equal to their tuition costs. Programs with shorter break even periods are listed first. A positive number for cost savings indicates the cost of degree was less for transfer students than new students. A positive break even difference (BE Diff) means transfer students recovered their costs faster by the number of months shown. Programs where transfer students spent less on their degree and had shorter break even periods are denoted by a green check mark.

### How are Tuition Costs Calculated for Each Program?

Tuition costs by program are based on the average number of credits graduates from a program earned at two-year (2) and four-year (4) colleges , and the average in-state cost per credit at two-year and four-year MUS schools. Private college tuition costs are not included. New student tuition costs only considers four-year credits and costs. For any program (p) the average tuition cost (TC) is calculated as follows:

$$TC_p = (Credit_{2p} \times Cost_2) + (Credit_{4p} \times Cost_4)$$

Variation in tuition costs by program comes from differences in the time it take students from each program to graduate. The cost per credit is the same for every program. The only variation in cost per credit comes from whether the credit was earned at a two-year or four-year college.

14 *The cost of tuition is calculated based on the number of credits students took to graduate, and the average in-state cost per credit at two-year and four-year colleges in the MUS. RMC and CC graduates and costs are not included.*

FIGURE 2.12

## BREAK EVEN ANALYSIS FOR NEW AND TRANSFER STUDENTS OBTAINING A BACHELOR'S DEGREE BY PROGRAM

| Program | New Students | | | Transfer Students | |
|---|---|---|---|---|---|
| | Cost | Break even Months | Avg. Wage 1Yr After Grad | Cost Savings | BE Diff |
| **Average, All Programs** | **$25,320** | **16.1** | **$23,974** | ✓ **$1,324** | **5.4** |
| Registered Nursing | $25,438 | 7.5 | $40,626 | ($1,203) | 0.2 |
| Petroleum Engineering | $23,417 | 7.7 | $36,585 | ($4,937) | NA |
| Diesel Technology | $22,484 | 8.4 | $32,284 | ($4,599) | NA |
| Automotive Technology | $20,817 | 8.8 | $28,359 | ($4,396) | NA |
| Computer Science | $25,424 | 9.8 | $31,190 | ($3,414) | 0.0 |
| Drafting and Design Technology | $23,531 | 10.1 | $28,006 | ($1,552) | NA |
| Civil Engineering | $25,980 | 10.3 | $30,139 | ($547) | (0.9) |
| Electrical and Electronics Engineering | $24,353 | 10.4 | $28,001 | ($3,500) | NA |
| HIT and Medical Coding | $22,812 | 10.5 | $26,023 | $622 | NA |
| Engineering, General | $25,574 | 10.6 | $29,021 | ($1,232) | 0.9 |
| Engineering Technologies, Other | $26,890 | 10.8 | $30,003 | ($2,431) | NA |
| Construction Engineering Technology | $27,718 | 11.0 | $30,164 | $924 | NA |
| Health Care Office Management | $26,371 | 11.3 | $28,118 | $1,779 | NA |
| Mechanical Engineering Technology | $27,768 | 11.3 | $29,366 | ($1,383) | NA |
| Geological/Geophysical/Mining Engineering | $24,480 | 11.5 | $25,582 | ($4,979) | NA |
| Computer/Info Science, Other | $27,695 | 11.5 | $28,824 | ✓ $7,894 | 3.5 |
| Accounting | $25,295 | 12.0 | $25,182 | ✓ $1,614 | 1.9 |
| Environmental Engineering | $24,654 | 12.4 | $23,594 | ($2,218) | NA |
| Mechanical Engineering | $25,019 | 12.7 | $23,058 | ($2,839) | NA |
| Public Administration | $26,259 | 12.9 | $24,127 | ($845) | NA |
| Finance | $24,720 | 13.1 | $22,054 | ✓ $3,156 | 2.2 |
| Agriculture | $24,090 | 13.3 | $21,183 | $611 | (3.3) |
| Special Education | $26,052 | 13.5 | $22,393 | ($1,651) | (0.7) |
| Business | $25,541 | 13.6 | $21,819 | ✓ $3,321 | 3.5 |
| Chemical Engineering | $23,803 | 13.9 | $18,464 | ($4,421) | NA |
| Marketing | $24,667 | 14.2 | $19,798 | $2,099 | 2.0 |
| Public Relations | $24,860 | 14.3 | $20,138 | $4,400 | 3.8 |
| Health Tech/Assistant | $27,256 | 14.3 | $21,214 | ($4,027) | NA |
| Elementary Education | $25,360 | 14.3 | $20,147 | ($351) | 0.8 |
| Human Services | $26,479 | 14.5 | $21,436 | $3,421 | (0.5) |
| Secondary Education | $27,152 | 14.5 | $21,536 | ($801) | 0.9 |
| Microbiology | $26,870 | 14.6 | $20,734 | ($383) | 3.1 |
| Industrial Engineering | $25,916 | 15.0 | $18,478 | ($1,077) | NA |
| Public Safety | $29,991 | 15.1 | $22,314 | ✓ $7,240 | 3.9 |
| Allied Health Diagnostic, Intervention, Treatment | $23,145 | 15.5 | $16,228 | ($5,324) | NA |
| Animal Science | $22,687 | 15.6 | $16,807 | ($2,841) | (3.1) |

*Source: MUS Warehouse. Costs based on average in-state tuition per semester at four-year colleges in Montana, and average time to completion by program. RMC and CC data not included. Student loan information not included. Transfer students by program excludes programs with less than ten transfer students. NA=not available. Average wage reported in 2015 dollars using the CPI-U.*

FIGURE 2.12 (CONTINUED)

## BREAK EVEN ANALYSIS FOR NEW AND TRANSFER STUDENTS OBTAINING A BACHELOR'S DEGREE BY PROGRAM

| Program | New Students | | | Transfer Students | |
|---|---|---|---|---|---|
| | Cost | Break even Months | Avg. Wage 1Yr After Grad | Cost Savings | BE Diff |
| Economics | $24,074 | 15.6 | $17,415 | ($938) | (2.4) |
| Social Work | $26,744 | 15.7 | $19,397 | ✓ $4,980 | 3.0 |
| General Studies | $29,429 | 15.7 | $21,333 | ✓ $6,940 | 6.2 |
| Mass Communication | $26,328 | 15.9 | $18,873 | ✓ $6,752 | 6.4 |
| Education, General | $25,195 | 16.0 | $17,211 | ($2,217) | 0.0 |
| Social Science, General | $25,493 | 16.0 | $18,638 | ✓ $850 | 1.0 |
| Sociology | $26,121 | 16.1 | $18,241 | ✓ $3,527 | 2.1 |
| Plant Science | $25,416 | 16.1 | $17,635 | ($3,031) | NA |
| Mathematics/Stats | $25,416 | 16.2 | $17,251 | ($514) | (3.5) |
| Communication Studies | $25,319 | 16.7 | $16,897 | ✓ $4,721 | 4.5 |
| Health Science, Other | $25,018 | 16.7 | $16,105 | ✓ $2,057 | 3.0 |
| Journalism | $23,161 | 17.1 | $14,720 | ✓ $660 | 2.6 |
| Kinesiology and Exercise Science | $24,938 | 17.4 | $15,400 | $1,223 | (0.1) |
| Chemistry | $23,792 | 17.7 | $15,183 | ($2,872) | 3.6 |
| Physical Science, Other | $22,939 | 17.8 | $14,567 | ($1,992) | 0.7 |
| Geology | $26,522 | 17.9 | $16,002 | ✓ $3,624 | 2.6 |
| Psychology | $25,139 | 18.0 | $15,781 | ✓ $3,409 | 3.2 |
| Environmental Science | $24,081 | 18.1 | $14,713 | ✓ $868 | 1.7 |
| Writing | $28,458 | 18.3 | $17,070 | $6,010 | NA |
| Political Science | $23,925 | 18.4 | $14,309 | ✓ $930 | 2.9 |
| Fish and Wildlife Management | $23,560 | 18.4 | $14,144 | ($1,044) | (0.8) |
| Music | $26,759 | 18.5 | $16,047 | $810 | (0.1) |
| Health and PE/Fitness, General | $25,759 | 18.6 | $15,138 | ✓ $1,707 | 1.4 |
| Biology, General | $25,106 | 18.9 | $14,641 | ✓ $1,122 | 2.7 |
| Forestry | $26,497 | 18.9 | $15,849 | $2,933 | NA |
| Physics | $24,855 | 18.9 | $13,595 | ($1,107) | NA |
| Natural Resource Conservation & Mgmt | $24,538 | 19.0 | $14,092 | ✓ $2,744 | 2.4 |
| History | $26,038 | 19.2 | $14,907 | ✓ $2,258 | 3.8 |
| Geography | $26,668 | 19.4 | $14,189 | $4,394 | NA |
| English | $25,755 | 19.4 | $14,510 | ✓ $1,451 | 2.1 |
| Cinematography and Film | $24,458 | 19.6 | $13,235 | $871 | (2.4) |
| Parks & Recreation | $26,595 | 19.7 | $14,553 | ✓ $3,589 | 4.8 |
| Foreign Languages and Literatures | $25,885 | 19.9 | $14,014 | ✓ $1,753 | 7.3 |
| Environmental Design/Architecture | $22,517 | 20.2 | $9,697 | ($2,718) | 0.4 |
| Visual and Performing Arts | $26,558 | 20.7 | $13,892 | ✓ $2,007 | 3.2 |
| Anthropology | $25,154 | 21.2 | $13,183 | $3,130 | (0.0) |
| Philosophy/Theology | $24,917 | 21.3 | $12,767 | $3,819 | NA |
| Linguistics | $24,185 | 22.3 | $12,263 | ($3,076) | NA |

*Source: MUS Warehouse. Costs based on average in-state tuition per semester at four-year colleges in Montana, and average time to completion by program. RMC and CC data not included. Student loan information not included. Transfer students by program excludes programs with less than ten transfer students. NA=not available. Average wage reported in 2015 dollars using the CPI-U.*

## 2.4.3 Highest Earning Potential for Graduate Degree Holders

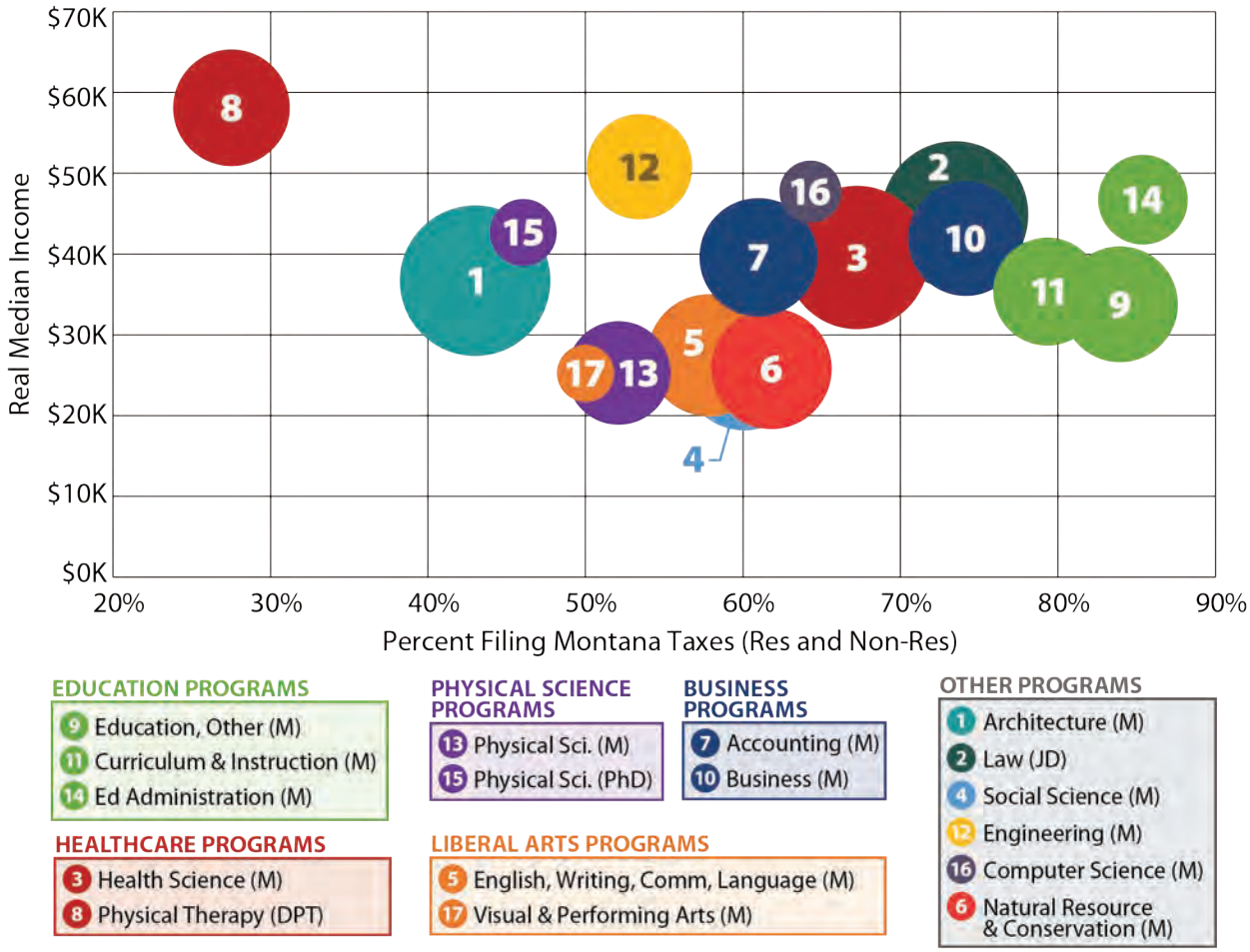
About 15% of graduates from Montana colleges hold a graduate degree, which includes master's, doctoral, and first professional degrees. These students have the highest earnings potential in Montana. Programs that primarily award graduate degrees (like law, architecture, physical therapy, and pharmacy) tend to have significantly higher wages than other programs. **Figure 2.13** shows the workforce outcomes for students obtaining a graduate degree by program. Only programs with at least ten graduates per year are included. The programs in the upper-right hand corner have better workforce outcomes than those in the lower-left corner. The size of the bubble corresponds to the number of graduates in each program since 2001, and the color corresponds to the program category.

Graduate degree programs with the ***HIGHEST INCOME*** are:

- Physical Therapy
- Engineering
- Computer Science
- Education Administration
- Law

FIGURE 2.13

### WORKFORCE OUTCOMES ONE YEAR AFTER GRADUATION FOR GRADUATE DEGREES BY PROGRAM




*Source: DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Income is defined as lines 7, 12, 17, and 18 on the Montana income tax return, not including farm income. Real income reported in 2015 dollars using the CPI-U. Only programs with at least ten graduates per year are included. (M) = Master's Degree (DPT) =Doctorate of Physical Therapy (JD) = Juris Doctorate*

On average, about 60% of students who earn a graduate degree stay in Montana for work. However, some graduate degree programs have higher retention rates. For example, about 80% of graduates with a master's in education remain in Montana after graduation, which is comparable to the high retention rates of associate degree holders. Students earning a graduate degree in business and law are also more likely to stay in Montana for work than the average graduate degree earner. Education administrators, lawyers, and MBA graduates have above-average retention rates and report median incomes above $40,000 a year after graduation.

Architecture is the largest graduate degree program shown in **Figure 2.13**. On average, only about 43% of architecture graduates stay in Montana after graduation, earning $36,000 in their first year for those that remain in the state. Compared to other graduate degree programs, architecture graduates have below-average workforce outcomes.

Workforce outcomes for liberal arts, physical science, and social science are also below average among graduate degrees. Master's degree graduates in these fields report income less than $30,000 one year after graduation. However, students able to obtain a PhD in physical science earn more. Graduates earning a PhD in the physical sciences reported income of about $42,000 one year after graduation, although less than half remained in Montana.

All graduate degree programs have higher median incomes than the median income for all bachelor's degree programs. Those earning a graduate degree in engineering, computer science, physical therapy, and law report the highest median incomes. Despite higher income levels, it is unclear if graduate degree earners have shorter or longer cost recovery because information on graduate degree costs was not available.

## 2.5 Employers Value Work Experience

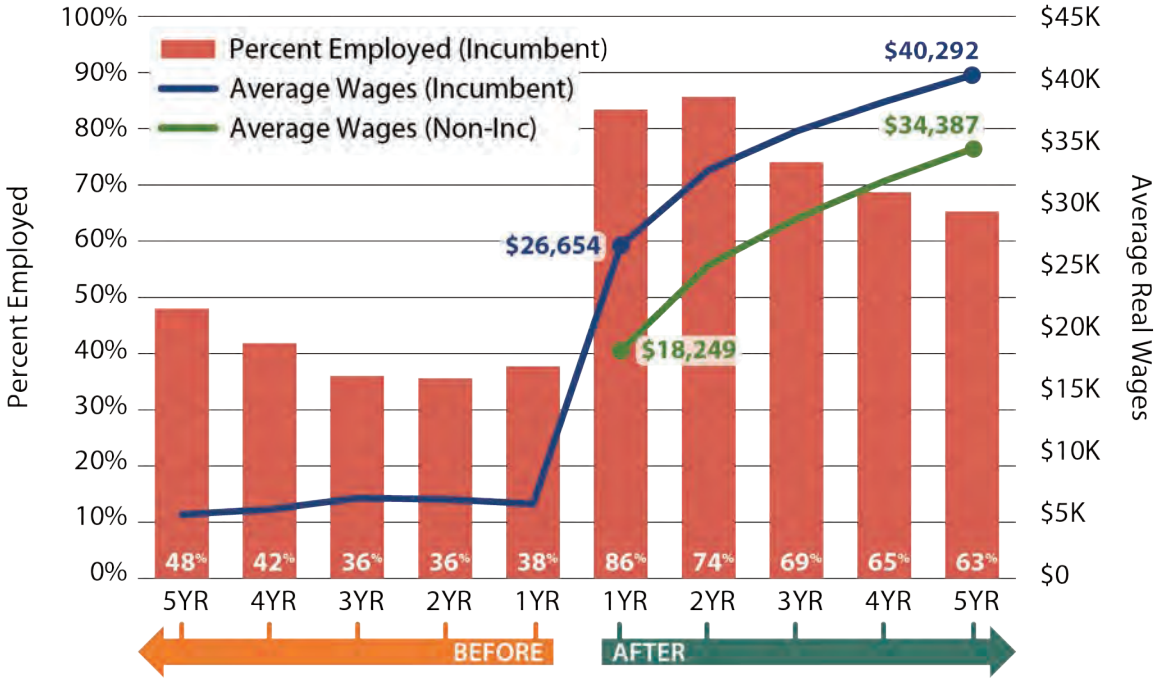
Graduates who worked while obtaining their degree benefited from their work experience by achieving higher wages and better employment outcomes post-graduation than graduates who had no prior connection to the Montana labor market. Fifty-five percent of graduates have had experience working for Montana employers prior to graduation. Incumbent workers' connection to the Montana labor market increased their likelihood of staying in Montana to work after graduation.[15] **Figure 2.14** depicts wage and employment outcomes for incumbent workers before and after graduation, compared to non-incumbent workers.

Graduates with work experience made **$8,000** more a year after graduation than those without prior connections to the Montana labor market.

15 *Incumbent workers are graduates who worked more than two quarters in a year on average over the five years before receiving their degree.*

FIGURE 2.14

## WORKFORCE OUTCOMES FOR INCUMBENT WORKERS BEFORE & AFTER GRADUATION




*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Real wages reported in 2015 dollars using the CPI-U.*

Eighty-six percent of incumbent workers were employed in Montana a year after graduation, compared to only about 50% of non-incumbent workers. They were also more likely to remain employed. Five years after graduation, 63% of incumbent works were still working in Montana compared to 33% of non-incumbents.

Wages for incumbent workers are higher than wages of non-incumbent workers. Initially, incumbent workers made about $8,000 more than workers without prior work experience made a year after graduation. The wage premium decreases over time as non-incumbent workers gained work experience. Five years after graduation, incumbent workers made about $6,000 more than non-incumbent workers did. The wage premium was the same for two-year and four-year college graduates.

## 2.6 Graduates Work in High-Wage Industries

The healthcare industry and the education industry employ the most graduates from Montana's colleges, with each industry employing about 20% of graduates working in Montana. In comparison, only 14% of the state workforce works in healthcare, and only 9% work in education. Healthcare and education are two of the top four largest programs of study for graduates; however, both of these industries hire a larger-than-expected share of graduates. Education, in particular, hires significantly more graduates than would be expected given its share of the economy. **Figure 2.15** shows employment and real wage outcomes for graduates by industry in the years after graduation.

FIGURE 2.15

## EMPLOYMENT AND REAL WAGES OF GRADUATES BY INDUSTRY

| Industry | One Year After Grad | | Five Years After Grad | | 2015 State Average Wage |
|---|---|---|---|---|---|
| | % of Employed Grads | Wages | % of Employed Grads | Wages | |
| Mining | 0.6% | $45,792 | 0.9% | $68,279 | $87,804 |
| Utilities | 0.3% | $47,170 | 0.7% | $65,417 | $87,460 |
| Finance | 3.8% | $27,913 | 5.4% | $42,134 | $60,081 |
| Professional & Technical Services | 7.8% | $31,510 | 9.6% | $48,652 | $59,409 |
| Wholesale Trade | 2.0% | $27,468 | 2.5% | $45,595 | $54,824 |
| Information | 1.8% | $23,593 | 1.9% | $37,525 | $48,500 |
| Construction | 3.8% | $23,298 | 3.8% | $37,672 | $47,828 |
| Manufacturing | 3.0% | $26,522 | 3.5% | $43,898 | $47,194 |
| Public Administration | 4.4% | $30,928 | 8.4% | $42,894 | $44,656 |
| Healthcare and Social Assistance | 20.4% | $29,830 | 20.8% | $41,293 | $44,446 |
| Transportation | 1.4% | $20,499 | 1.3% | $33,732 | $41,489 |
| Agriculture | 0.8% | $18,523 | 0.8% | $25,680 | $36,542 |
| Real Estate | 1.0% | $19,851 | 1.0% | $31,970 | $33,565 |
| Admin and Waste | 4.7% | $17,258 | 3.6% | $29,394 | $32,057 |
| Retail Trade | 10.4% | $18,316 | 7.1% | $33,646 | $27,671 |
| Other Services | 2.7% | $18,067 | 2.9% | $27,755 | $27,333 |
| Educational Services | 19.5% | $24,086 | 19.7% | $37,094 | $26,638 |
| Arts, Entertainment, & Recreation | 2.5% | $12,240 | 1.8% | $20,456 | $20,282 |
| Accommodation and Food Service | 9.0% | $12,212 | 4.3% | $18,720 | $16,715 |

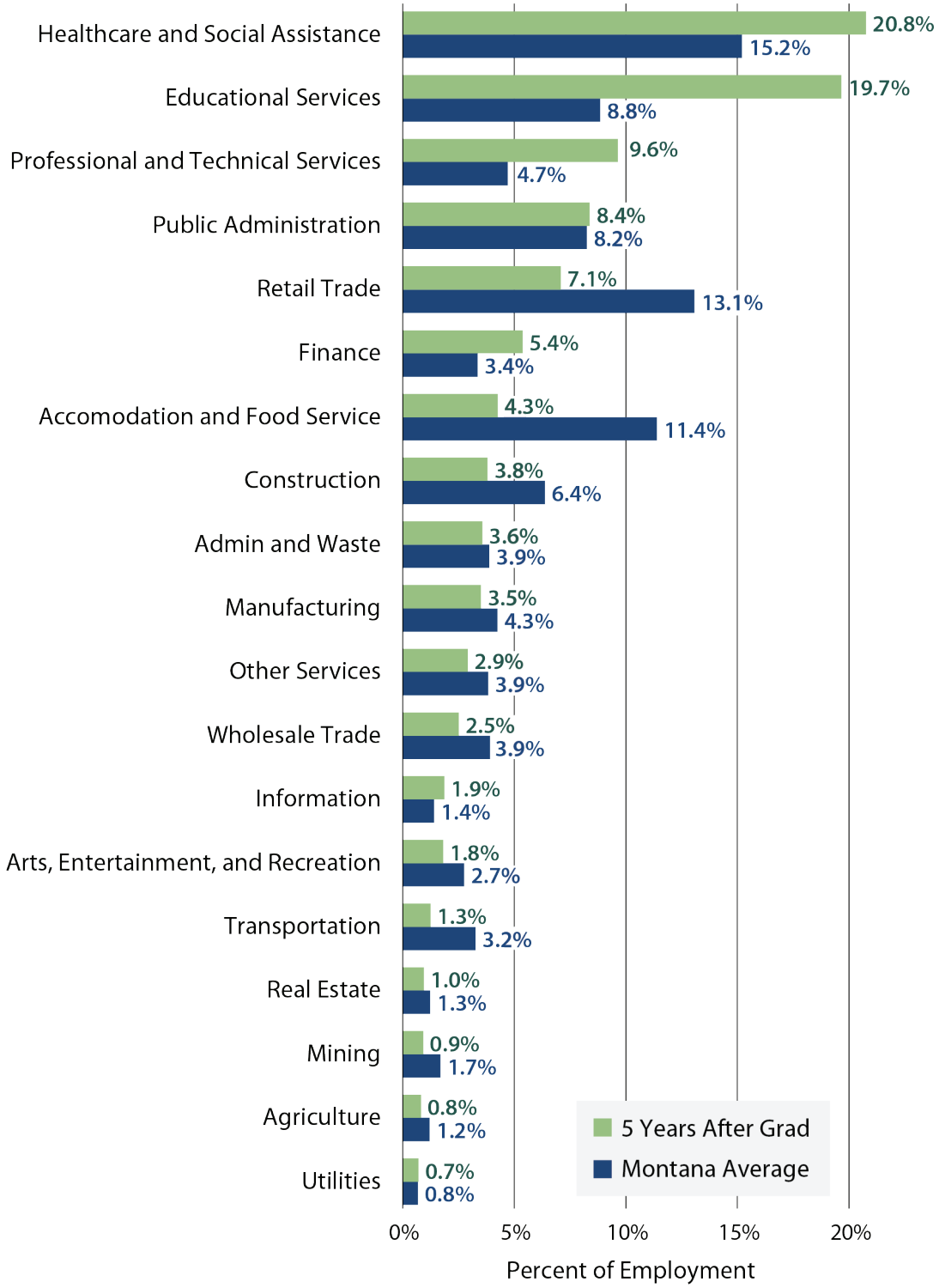
*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Real wages reported in 2015 dollars using the CPI-U. State wage data from Quarterly Census of Employment and Wages 2015 average.*

Over time, graduates who remain employed in Montana tend to move into higher-paying industries. One year after graduation, 9% of graduates work in the accommodation and food service industry, and another 10.4% work in retail trade. Both of these industries pay below-average wages. Five years after graduation, only 4.3% of employed graduates were working in accommodation and food service, and only 7.1% were working in retail trade. The drop in employment for these industries suggests graduates were working as retail sales workers or waiters temporarily, while searching for career opportunities in higher-paying industries. These industries may also be providing valuable training to graduates who need to build soft skills before they can find a job in higher-paying industries.

**Figure 2.16** shows the distribution of graduate employment by industry five years after graduation compared to the statewide distribution of industry employment. After five years, the largest employing industry was healthcare, followed by education and professional and technical services. Professional and technical services includes occupations like lawyers, engineering, architects, and other high-wage occupations typically requiring a post-secondary education.

FIGURE 2.16

## EMPLOYMENT AND WAGES BY INDUSTRY STATEWIDE COMPARED TO MONTANA COLLEGE GRADUATES




*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Real wages reported in 2015 dollars using the CPI-U. State wage data from Quarterly Census of Employment and Wages 2015 average.*

FIGURE 2.17

## WHAT IS IN EACH INDUSTRY?

| Super Sector | Code | Industry | Establishments primarily engaged in: | Examples |
|---|---|---|---|---|
| Agriculture | 11 | Agriculture | Raising crops or animals, harvesting timber, and harvesting animals from natural habitats. | Farms, ranches, greenhouses, orchards, hatcheries and logging operations |
| Mining and Utilities | 21 | Mining | Extracting naturally occurring mineral solids, liquids, and gases. | Oil and gas, coal and mineral mining, and associated support activities. |
| | 22 | Utilities | The provision power, natural gas, water supply, and sewage removal. | Utility companies, sewage removal |
| Construction | 23 | Construction | Construction of buildings, highways, or engineering projects. | Contractors, plumbing and electrical companies, highway construction |
| Manufacturing | 31-33 | Manufacturing | Transformation of materials into new products. | Machine shops, breweries, wood product and food manufacturing |
| Trade and Transportation | 42 | Wholesale Trade | Arranging the sale of nonconsumer goods, and raw materials used in production | manufacturers' sales representatives, merchant wholesalers |
| | 44-45 | Retail Trade | Selling merchandise in small quantities to the public. | Automotive dealers, office supply stores, gas stations, grocery stores, clothing stores |
| | 48-49 | Transportation and Warehousing | Transportation of passengers and cargo, warehousing and storage, and sightseeing. | Trucking companies, air, rail and water transport, postal and delivery services |
| Information | 51 | Information | Producing, distributing, or transmitting information and entertainment. | Newspapers, TV and radio, telecommunication companies |
| Financial Activities | 52 | Finance | Facilitating financial transactions. | Banks, credit unions, and insurance agencies |
| | 53 | Real Estate | Renting, leasing, and providing related services. | Real estate agents and brokers, auto, machinery and general goods rental |
| Business Services | 54 | Professional and Technical Services | Performing professional, scientific, and technical activities for others. | Legal, accounting, architectural, payroll, engineering, computer programing, and scientific research |
| | 55 | Management of Companies | Manage the strategic role of the company or enterprise. Facilitate mergers. | Managing offices, holding companies |
| | 56 | Admin and Waste | Performing support activities of other organizations. Temporary employment firms. | Office administrative and facilities support services, collection agencies, security services |
| Healthcare and Education | 61 | Educational Services | Providing instruction and training. They may be private for-profit, non-profit or public. | Schools, colleges, universities, and training centers. |
| | 62 | Healthcare and Social Assistance | Delivering healthcare and social assistance from trained professionals. | Hospitals, elderly care facilities, childcare, mental health and family services |
| Leisure Activities | 71 | Arts, Entertainment, and Recreation | Cultural, entertainment, and recreational services. | Casinos, museums, theatre, amusement parks, sports and recreation facilities |
| | 72 | Accommodation and Food Service | Providing lodging, meals, snacks, and beverages for immediate consumption. | Restaurants, hotels, bars, caterers RV parks |
| Other | 81 | Other Services | Any other service not previously classified. | Auto and machine repair, religious activities, grant making, dry-cleaning and laundry services |
| Public Admin | 92 | Public Administration | Federal, state and local government agencies. Excludes education and public works construction classified above. | Local and state agencies, police and fire protection |

*Source: North American Classification System 2012.*

## 2.6 Graduates Work in their Field of Study

After graduation, most graduates in Montana work in industries commonly associated with their degree. Consistent matches between program of study and industry of employment indicates graduates are well-prepared to work in their field of study, and their field of study is in demand. **Figure 2.18** shows the top industries of employment for graduates by program of study.

**Only payroll employment is included.** Programs with high-levels of self-employment may not be accurately represented. For example, agriculture graduates working on their own farm aren't captured in payroll employment.

FIGURE 2.18

### INDUSTRIES HIRING THE MOST GRADUATES BY PROGRAM

| Program Category | Top Employer | % of Employed Graduates | 2nd Largest Employer | % of Employed Graduates | 3rd Largest Employer | % of Employed Graduates |
|---|---|---|---|---|---|---|
| **Health Professions** | Healthcare | 75% | Public Admin | 6% | Retail Trade | 6% |
| **Education** | Education | 73% | Healthcare | 8% | Public Admin | 3% |
| **Architecture** | Prof & Tech Service | 67% | Construction | 7% | Education | 4% |
| **Legal Professions** | Prof & Tech Service | 53% | Public Admin | 30% | Other Services | 3% |
| **Human Services** | Healthcare | 39% | Public Admin | 26% | Education | 9% |
| **Engineering** | Prof & Tech Service | 34% | Construction | 14% | Manufacturing | 13% |
| **Culinary Arts & Recreation** | Healthcare | 28% | Education | 20% | Public Admin | 9% |
| **Computer & Info Science** | Prof & Tech Service | 27% | Public Admin | 13% | Finance | 9% |
| **Physical Science** | Education | 22% | Healthcare | 17% | Prof & Tech Service | 16% |
| **Social Science** | Healthcare | 22% | Public Admin | 16% | Education | 10% |
| **Liberal Arts** | Education | 20% | Healthcare | 14% | Retail Trade | 11% |
| **Business** | Finance | 19% | Prof & Tech Service | 13% | Retail Trade | 10% |
| **Construction & Transport** | Construction | 17% | Manufacturing | 14% | Retail Trade | 13% |
| **Ag & Natural Resource** | Education | 16% | Public Admin | 15% | Prof & Tech Service | 12% |
| **Communication** | Information | 16% | Education | 12% | Healthcare | 10% |

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Healthcare industry is NAICS 62 Healthcare and Social Assistance. Prof & Tech Service represents NAICS 54 Professional and Technical Services. Program of study shown is the program associated with the graduate's highest degree earned in Montana.*

Graduates in agriculture, liberal arts, education, and physical science are most commonly employed in the education industry. Architecture, computer and information science, engineering, and legal profession graduates are most commonly working in the professional and technical services industry. Three-fourths of healthcare graduates working in Montana are employed in the healthcare industry. Six percent are working in retail trade, likely pharmacists working in grocery or drug stores like Safeway, Costco, or Walgreens.

A mismatch between industry of employment and program of study can indicate that either employers do not have enough qualified applicants for their positions, or that graduates working in industries outside their program of study do not have the qualifications to obtain a job in their field.

There are not many cases of this mismatch occurring between Montana graduates and employers. One program-industry match that may look inconsistent is culinary arts and recreation graduates working in healthcare, education, and government. These graduates may be working in hospital cafeterias utilizing their degree. Graduates from this program category also include those studying fitness, physical education, kinesiology, and exercise science. These graduates are likely using their education in their career working for healthcare, education, and public administration companies.

There are a number of graduates working in retail trade who graduated in liberal arts, business, and construction, mechanic and transportation programs. Retail trade is not an industry commonly associated with these programs. Business, liberal arts, and construction, mechanic and transportation graduates working in retail may not be able to find desirable employment opportunities in their field of study, or they are not qualified to fill positions in their field.

## 2.7 Graduate Employment by Business Size

The majority of businesses in Montana (62%) have fewer than five employees. These businesses employ about 6% of graduates working in Montana. Most graduates working in Montana work for large employers. About 50% of graduates work for an employer with at least 100 employees, even though these businesses make up less than 2% of the businesses in Montana. **Figure 2.19** shows the percent of graduates working for Montana employers in the years after graduation by business size. Over time, graduate employment becomes slightly more concentrated in larger businesses. In general, larger businesses tend to pay higher wages and provide better benefits than smaller businesses. Thus, we would expect graduates to move toward these higher paying employers as they gain experience.

FIGURE 2.19

### GRADUATE EMPLOYMENT BY BUSINESS SIZE AFTER GRADUATION

| Number of Employees | Percent of Businesses | Percent of Graduates Employed After Graduation | | |
|---|---|---|---|---|
| | | 1 Year After | 3 Years After | 5 Years After |
| Fewer than 5 | 61.8% | 6.0% | ↑ 6.1% | ↑ 6.4% |
| 5 to 9 | 18.1% | 7.8% | ↓ 7.7% | ↔ 7.7% |
| 10 to 19 | 10.4% | 9.4% | ↓ 9.3% | ↓ 8.9% |
| 20 to 49 | 6.2% | 14.5% | ↓ 13.7% | ↓ 12.8% |
| 50 to 99 | 1.9% | 11.4% | ↓ 10.7% | ↓ 10.5% |
| 100 to 249 | 1.2% | 14.9% | ↑ 15.2% | ↑ 15.3% |
| 250 to 499 | 0.3% | 8.1% | ↑ 8.7% | ↑ 9.1% |
| 500 to 999 | 0.1% | 8.2% | ↑ 8.9% | ↑ 9.0% |
| 1,000 and over | 0.1% | 19.6% | ↑ 19.8% | ↑ 20.3% |

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Distribution of businesses calculated using 2015 average Quarterly Census of Employment and Wages micro data from MTDLI. Arrows represent change in graduate employment over time.*

The most common employers of Montana graduates consist primarily of educational institutions and healthcare providers. **Figure 2.20** shows the top ten employers of Montana graduates in the state one year after graduation. There is very little change in the top ten employers of Montana graduates over time. All of these employers have over 1,000 employees, and are some of the top employers in the state.

FIGURE 2.20

## TOP EMPLOYERS OF MONTANA COLLEGE GRADUATES

- Benefis Healthcare
- Billings Clinic
- Billings School District
- Bozeman Deaconess Health Services
- Great Falls School District
- Missoula County Public Schools
- Montana State University
- St Patrick Hospital
- St Vincent Healthcare
- University of Montana

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Employers listed alphabetically.*

## SECTION 2 HIGHLIGHTS

- Most graduates work in the state after graduation. Approximately 69% work for a Montana employer one year after graduation, and 74% will work for a Montana employer at some point after graduation (**Figure 2.2**).
- Graduates work in every county in the state, demonstrating the important role of Montana colleges in workforce development throughout the state (**Figures 2.3** and **2.4**).
- Graduates earn above the median wage in Montana within three years of graduation, and those working year-round earn above the median wage within a year of graduation (**Figure 2.1**).
- Graduates with higher education are less likely to work in Montana after graduation (**Figure 2.5**). About 84% of associate degree graduates earned income in Montana a year after graduation, compared to 67% of bachelor's degree earners and 52% of PhD graduates.
- Increased education levels are associated with higher wages, but the amount depends on the program of study. For example, information technology graduates have a high wage premium from bachelor's degree attainment, but registered nursing graduates have little difference between associate degree and bachelor's degree wages (**Figure 2.6**).
- Associate degree and post-secondary certificate earners recover their tuition costs within a year of graduation (**Figures 2.9** and **2.10**). Health professions have the best workforce outcomes among associate degree programs (**Figure 2.8**). However, construction, mechanic and transportation program graduates have the shortest break even periods.
- Bachelor's degree earners recover their costs within two years, with the shortest break even periods for registered nursing, computer science, and engineering (**Figure 2.12**).
- On average, bachelor's students who transfer from a two-year institution have lower costs and are able to recover their costs faster than students attending a four-year institution all four years (**Figure 2.12**).
- Students who worked while pursuing their degree were more likely to work in Montana after graduation and earned an average of $8,000 more a year after graduation (**Figure 2.14**).
- The healthcare industry and the education industry employ the most graduates from Montana's colleges. Each industry employs about 20% of graduates working in Montana (**Figure 2.15**).
- Most graduates work in industries associated with their program of study, indicating they are well prepared to work in their field of study, and their field of study is in demand (**Figure 2.18**).

SECTION 3:

# MONTANA SUPPLY AND DEMAND ANALYSIS

The primary research question of this report considers how well the Montana college education system meets the workforce demand of Montana employers, thus ensuring public tax dollars are achieving the greatest benefit for both students and businesses. If employers are demanding more workers in an industry or occupation than what is produced by the education system, then it suggests that students who pursue a career in that industry or occupation will have consistent employment growth and wages after graduation. Matching graduates with worker demand ensures that students are pursuing lucrative careers, and businesses are able to find the workforce they need to promote economic growth.

This section of the report approaches the match between employers and graduates from three perspectives – by industry, by occupation, and by program of study. Lastly, the workforce outcomes by program are presented to provide further insight into employer demand, and to help confirm the other analyses. This method of evaluation provides the most comprehensive look at the match between graduates and jobs, and provides greater confidence in the results because the same conclusions can be reached using four different methods.

## Understanding the Supply and Demand for Graduates through Four Different Analyses

| Analyses | Definition | Strengths | Weaknesses |
|---|---|---|---|
| By Industry | Compares number of graduates working in each industry to industry demand. | Each student is only counted once based on their actual industry of employment. Only graduates who stay in Montana are counted in supply. | Demand does not include replacement needs. Includes demand for jobs that do not require a college degree. |
| By Occupation | Compares projected job openings for high-demand occupations to the number of graduates trained to work in the occupation. | Focuses on high-demand occupations that require a college education. Can help colleges identify areas for new program development. | Graduates are double-counted in the supply of workers by occupation if they are qualified to fill multiple occupations with their degree. |
| By Program | Compares the number of graduates in each program to the projected demand for jobs graduates from the program can fill. | Allows for a direct comparison of the relative demand for each program. Identifies areas for program expansion, and potential capacity reductions. | Includes demand for jobs that do not require a college degree. Overestimates demand in cases where a job can be filled by graduates from multiple programs. |
| Workforce Outcomes | Compares likelihood of retention in Montana workforce and reported income levels after graduation by program. | Depicts actual workforce outcomes as an indication of employer demand levels. Helps confirm prior conclusions. | Only includes individuals employed in Montana. Lower retention may not indicate low demand if graduates find employment in other states. |

There are some data limitations associated with the supply and demand analysis that stem from graduates in any particular field being qualified to fill multiple positions in multiple industries. Since the fall of 2001, the colleges have issued degrees to approximately 100,000 graduates in 230 different programs. These graduates were prepared to fill jobs in over 365 different occupations. Graduates are therefore double-counted in the supply of workers by occupation if they are qualified to fill multiple occupations. For example, a number of social worker occupations are identified as oversupplied in the occupational analysis. However, all those occupations rely on graduates from the social work program, which does not produce enough graduates to meet the demand for all social work occupations. The analysis by program of study only counts students once in each program, but overestimates demand in cases where an occupation can be filled by graduates from multiple programs. Presenting gap analysis from four different perspectives is necessary to overcome flaws inherent with this type of analysis and provide greater confidence in research conclusions.

The demand for workers in Montana comes from the employment projections developed by MTDLI. MTDLI produces employment projections by industry and occupation every year for the two-year and ten-year timeframes for the state, and each of the five regions.[16] These projections include both new job growth by occupation (growth openings) and the number of workers needed to replace workers who leave the occupation (replacement openings). Total openings are the sum of the openings due to growth plus the replacement openings. Workforce demand is best interpreted as a relative instead of absolute measure. While the exact number of job openings is difficult to predict, drawing conclusions about the demand for one occupation relative to another is more reliable.

### What does it mean for colleges to "meet demand"?

Montana colleges are expected to have the capacity to fill new job openings and job openings due to retirements. Colleges may also need the capacity to train existing workers looking to change careers. The post-secondary training system is considered to have met demand if supply falls within a range, where the lower bound is equal to the number of new job openings and openings due to retirements. The upper bound is total job openings, which includes career changes (job-to-job).


This presentation of the employment projections assumes that other training organizations are producing enough workers to fill at least some of the openings created by career changes.

*16 More information about the employment projections can be found in the methodology section and at lmi.mt.gov.*

As Montana's population continues to age and labor markets tighten, the post-secondary training system will need fill job openings generated by retirements as well as new job openings. Individuals looking to change careers may also need retraining from the post-secondary system. The post-secondary training system is considered to have met demand if supply falls within a range, where the lower bound is equal to the number of new job openings and openings due to retirements. The upper bound is total job openings, which includes career changes (job-to-job openings).

## 3.1 Supply and Demand by Industry

The Montana economy is projected to add roughly 5,500 jobs per year through 2025, translating to about 1.2% growth annually. Faster growth is expected in the near term because of strong job growth momentum, particularly in healthcare, construction, and accommodation and food service. In the long term, Montana's employment growth is expected to slow in part because of restricted labor supply due to the state's aging population.[17] **Figure 3.1** illustrates workforce demand by industry in Montana.

FIGURE 3.1

CURRENT EMPLOYMENT AND PROJECTED GROWTH BY INDUSTRY

| Industry | Employment 2016 | Projected Annual Growth Rate | Projected Annual Job Gain |
|---|---|---|---|
| Healthcare | 69,751 | 1.5% | 1,100 |
| Construction | 29,091 | 2.7% | 815 |
| Accommodation & Food Service | 52,720 | 1.2% | 626 |
| Retail Trade | 59,582 | 1.0% | 585 |
| Professional & Technical Services | 21,671 | 2.1% | 486 |
| Admin & Waste | 17,146 | 1.9% | 362 |
| Public Administration | 37,446 | 0.6% | 274 |
| Arts, Entertainment & Recreation | 12,421 | 1.8% | 226 |
| Other Services | 17,534 | 1.1% | 191 |
| Finance | 15,352 | 1.1% | 168 |
| Transportation | 14,672 | 1.0% | 154 |
| Wholesale Trade | 17,464 | 0.7% | 129 |
| Educational Services | 40,042 | 0.3% | 113 |
| Mining | 6,609 | 1.4% | 112 |
| Agriculture | 5,528 | 1.5% | 85 |
| Manufacturing | 19,520 | 0.4% | 74 |
| Real Estate | 5,850 | 1.1% | 65 |
| Management of Companies | 2,082 | 1.6% | 34 |
| Information | 6,431 | (0.3%) | (16) |
| Utilities | 3,411 | (0.8%) | (22) |

*Source: MTDLI 2015-2025 employment projections.*

17 *Montana Employment and Labor Force Projections: Job Growth from 2015 to 2025, MTDLI.*

Healthcare is the largest employing industry in Montana, with average employment of close to 70,000. Healthcare employment has been growing consistently over the last twenty years at an average rate of 2.7%. Healthcare is projected to have the greatest demand for workers, adding roughly 1,100 jobs per year at a growth rate of 1.5%. Construction and professional and technical services demand is estimated to grow the most rapidly in percentage terms over the next ten years, at 2.7% and 2.1% respectively.

Healthcare is the most common industry of employment for graduates from the Montana colleges included in this study, followed closely behind by education. The college supply over the last three years exceeds estimated future job growth for these two industries, suggesting colleges have the capacity to meet workforce needs in education and healthcare. **Figure 3.2** illustrates the percentage of projected industry employment growth that Montana colleges could supply. Supply of graduates by industry is measured as the average number of graduates employed in each industry over the last three years to smooth variations in worker supply. Industry employment projections only capture new job growth and do not include openings due to replacements.

Colleges are producing the most graduates in education, relative to demand. Colleges appear to have the capacity to meet workforce needs in the education, healthcare, retail trade, public administration, finance, and manufacturing industries. However, industries where supply exceeds demand may not be oversupplied because **Figure 3.2** only depicts job openings due to growth; replacement openings are not included.

### Limitations of Supply and Demand analysis by Industry:

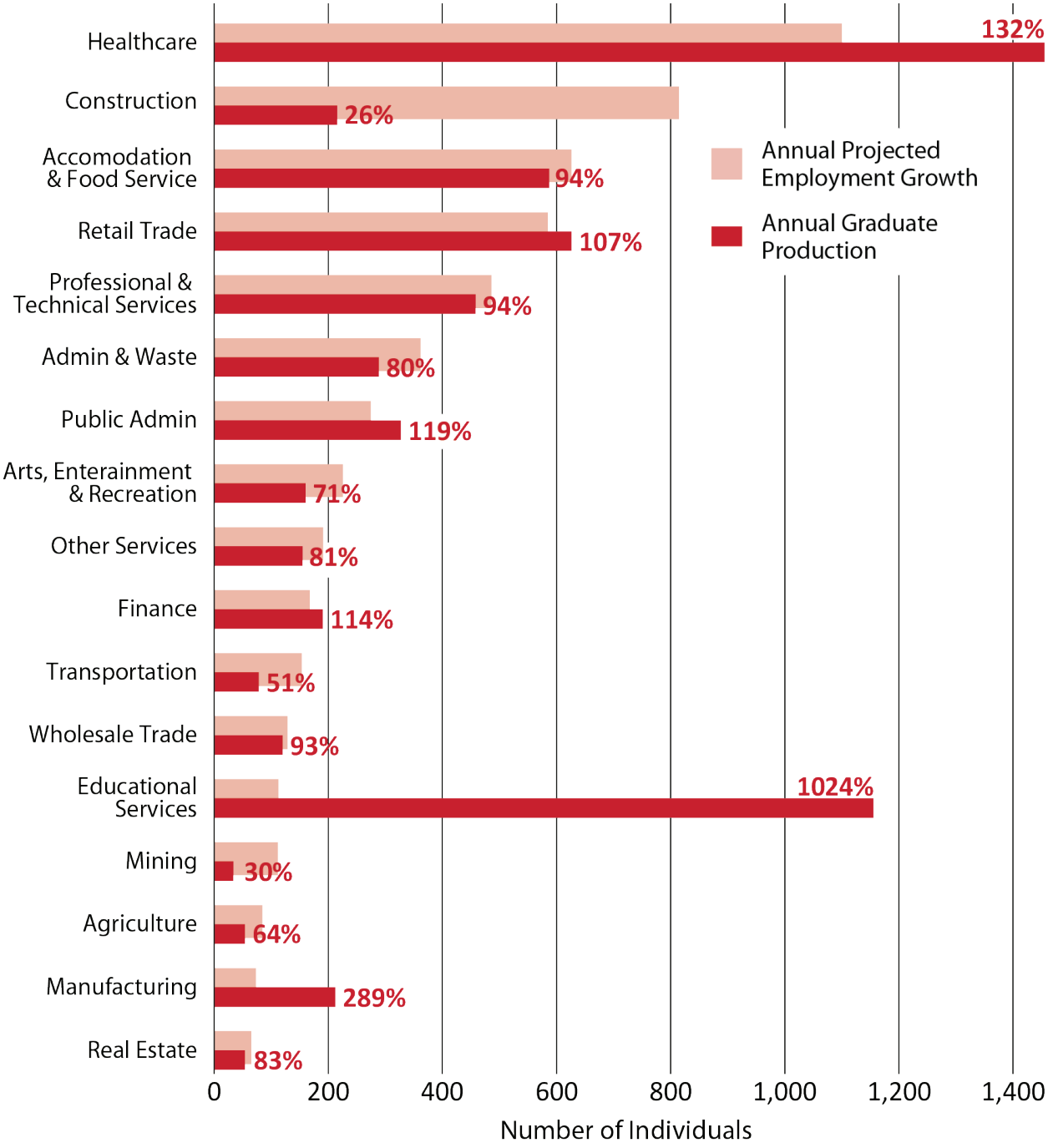
- Replacement openings not included
- Industry demand can stem from occupations that do not require a college degree.

Construction, mining, transportation, agriculture, and arts, entertainment and recreation are all industries where Montana colleges have not demonstrated the capacity to meet demand over the last three years. Construction has the second largest estimated demand for workers in Montana over the next ten years, yet the colleges have historically supplied less than 30% of that demand. However, these industries are comprised of a variety of occupations, many of which do not require post-secondary education. Therefore, Montana colleges should not be expected to fill 100% of job growth in these industries. Comparing the supply and demand of workers by occupation will help shed light on whether Montana college graduates are able to fill certain jobs.

Montana colleges are not expected to fill 100% of job demand some occupations in each industry do not require a college degree.

FIGURE 3.2

## PERCENT OF INDUSTRY DEMAND SUPPLIED BY MONTANA COLLEGES




*Source: MTDLI 2015-2025 employment projections. MTDLI, OCHE, RMC, and CC graduate data wage match. Supply is the average annual number of graduates employed in an industry one year after graduation over the last three academic years. Industry demand is the total annual projected job openings in the industry, not including replacement openings.*

## 3.2 Supply and Demand by Occupation

An estimated 11,900 workers will retire or otherwise leave their jobs in Montana every year through 2025. These replacement openings combined with annual employment growth of 5,500 jobs means that Montana will need roughly 17,400 workers each year to fill job openings.[18] Most of these job openings will be to replace workers in food preparation, sales, and office and administrative support occupations. These occupations tend to see high turnover rates because they consist of mainly entry-level, part-time, or seasonal positions.

Most of the 17,400 projected job openings in Montana will not require a college degree. MTDLI estimates almost 70% of job openings will require a high school diploma or less. Another 18% of openings will typically require a bachelor's degree, and 6% will require an associate degree. **Figure 3.3** shows the educational distribution of estimated employment growth in Montana through 2025.

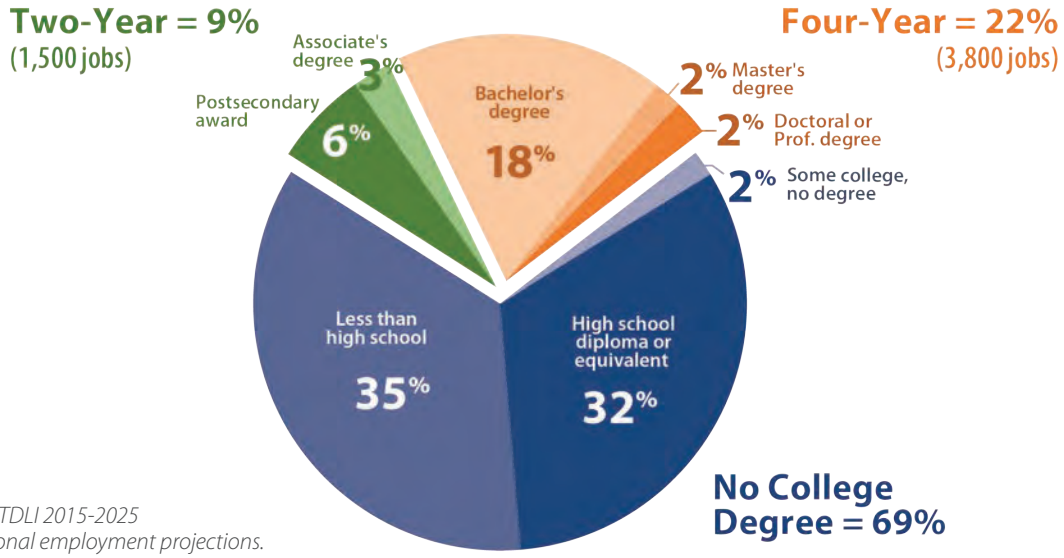
### HOW DO YOU KNOW WHAT EDUCATION LEVEL IS TYPICALLY REQUIRED TO FILL A POSITION?

The U.S. Department of Labor (DOL) determines the typical education level most workers need to enter an occupation. The typical education level is determined based on analyses of qualitative and quantitative information. Sources of quantitative data include educational attainment data from the American Community Survey; data on education from the Occupational Information Network (O*NET); and data on postsecondary program completions from the National Center for Education Statistics. In addition, DOL economists evaluated qualitative information obtained from educators, employers, workers in the occupation, training experts, and representatives of professional and trade associations and unions.

Information on education levels are available here: https://www.bls.gov/emp/ep_education_tech.htm

FIGURE 3.3

OCCUPATIONAL DEMAND BY EDUCATION LEVEL




*Source: MTDLI 2015-2025 Occupational employment projections.*

18 *Montana Employment and Labor Force Projections: Job Growth from 2015 to 2025, MTDLI.*

The occupational supply and demand analysis focuses on only high-demand occupations in Montana that require a postsecondary degree. High-demand occupations are in the top 25% for total annual job openings among all occupations that require the same level of education. There are 94 high-demand occupations in Montana requiring at least some college education. Supply for each occupation is measured as the average number of graduates over the last three years trained to work in the occupation. Many programs prepare graduates to work in a number of occupations. Therefore, graduates are double-counted in the supply of workers by occupation if they are eligible to fill multiple occupations. For example, a graduate with a business degree could fill jobs in accounting, management, finance, or other roles, and is therefore counted once in each of these occupations.

The supply and demand analysis by occupation groups occupations into four categories: undersupplied, meets demand, oversupplied, and no program. The no program category identifies high-demand occupations that cannot be filled by graduates from Montana college programs. These occupations may be good areas for new program development by the education system. **Figure 3.4** summarizes the results of the occupational supply and demand analysis by category for the high-demand occupations requiring post-secondary education.

## FIGURE 3.4
## SUPPLY AND DEMAND ANALYSIS BY OCCUPATION

| Category | # of Occupations | Percent |
|---|---|---|
| UNDERSUPPLIED | 10 | 10.6% |
| NO PROGRAM | 20 | 21.3% |
| MEETS DEMAND | 5 | 5.3% |
| OVERSUPPLIED | 59 | 62.8% |

*Source: MTDLI 2015-2025 employment projections. MTDLI, OCHE, RMC, and CC graduate data.*

Montana colleges have the capacity to meet demand for **68%** of high-demand occupations requiring some college education.

The supply and demand analysis by occupation suggests Montana colleges are meeting demand for 5% of high-demand occupations requiring a postsecondary degree, and oversupplying 63% of occupations. Another 10% of high-demand occupations are undersupplied, meaning colleges have not demonstrated the capacity to fill the expected number of new job openings and job openings due to retirements. About a 21% of high-demand occupations are not associated with any programs

**UNDERSUPPLIED** – The average annual supply of graduates trained to work in the occupation is less than the projected number of new job openings and openings due to retirements.

**MEETS DEMAND** – The average annual supply of graduates from colleges over the last three academic years falls within openings due to growth and retirements, and total openings.

**OVERSUPPLIED** – The average annual supply of graduates is greater than the number of projected total openings.

**NO PROGRAM** – Colleges have not produced any graduates in the last three years trained to work in the high-demand occupation. These occupations may be good targets for new programs development, particularly those with high-wages.

currently offered at colleges included in this study. **Figure 3.5** shows some of the occupations listed in each supply and demand analysis category. Only occupations with a median wage above the statewide median are listed in the "no program" category. Prioritizing new program development for occupations that are high-demand and high-wage occupations will help ensure the colleges are serving the greatest industry need, while also helping students pursue lucrative careers.

FIGURE 3.5

## SELECT HIGH-DEMAND OCCUPATIONS BY SUPPLY AND DEMAND CATEGORY

| Undersupplied | No Program (Median Wage> Statewide) | Meets Demand | Oversupplied (% Ed Level is 100%) |
|---|---|---|---|
| • Teacher Assistants<br>• Nursing Assistants<br>• Dental Assistants<br>• Automotive Service Techs & Mechanics<br>• Heating, Air Conditioning, Refrigeration Mechanics & Installers<br>• Training and Development Specialists<br>• Paralegals and Legal Assistants<br>• Human Resources Specialists<br>• Clergy<br>• Medical & Clinical Laboratory Technologists | • Heavy and Tractor-Trailer Truck Drivers*<br>• Business Operations Specialists<br>• Purchasing Agents<br>• Compliance Officers<br>• Occupational Therapists<br>• Dentists<br>• Family and General Practitioners<br>• Veterinarians<br>• Chiropractors<br>• Optometrists<br>• Psychiatrists | • Dental Hygienists<br>• Personal Financial Advisors<br>• Graphic Designers<br>• Mental Health Counselors<br>• Nurse Practitioners | • Radiologic Technologists<br>• Web Developers<br>• Physical Therapist Assistants<br>• Loan Officers<br>• Civil Engineers<br>• Child/Family/School Social Workers<br>• Elementary School Teachers<br>• Middle School Teachers<br>• Secondary School Teachers<br>• PR & Fundraising Manager<br>• Financial Managers<br>• Mental Health & Substance Abuse Social Workers<br>• Mechanical Engineers<br>• Physical Therapists<br>• Physician Assistants<br>• Education Administrators<br>• Ed, Guidance, School, & Vocational Counselors<br>• LPN and LVNs<br>• EMTs and Paramedics<br>• Medical Records & HIT<br>• Medical Assistants<br>• Bookkeepers, Accounting & Auditing Clerks |

*Source: MTDLI 2015-25 employment projections. OCHE, RMC, and CC graduate data. Only oversupplied occupations where all of the college supply has the typical education level required for the occupation are included. Occupations with a median wage above the statewide median are shown in the no program category. *Heavy & Tractor-Trailer Truck drivers require a commercial driver's license, which is not included in Montana college graduate data.*

Most high-wage occupations not currently served by Montana colleges are in healthcare. Dentists, occupational therapists, veterinarians, optometrists, and family and general practice doctors are among those occupations listed as areas for new program development. These occupations all require a doctoral or professional degree. Expanding the education system to offer programs for these occupations would require a large investment from the universities, and from healthcare employers who would need to offer resources for clinical training. Any decision about expanding the healthcare programs offered in Montana should consider these costs. **Figure 3.6** shows all high-demand occupations in Montana requiring a graduate degree.

FIGURE 3.6

## SUPPLY AND DEMAND ANALYSIS FOR OCCUPATIONS TYPICALLY REQUIRING A GRADUATE DEGREE

| Degree | Demand | Occupation | College Supply | % with Grad Degree | Demand | | GAP | Montana Median Wage |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Total Openings | | |
| Master's degree | Very-High | Nurse Practitioners | 22 | 100% | 22 | 27 | Equal | $92,000 |
| | | Mental Health Counselors | 44 | 37% | 41 | 53 | Equal | $33,270 |
| | | Physician Assistants | 30 | 100% | 18 | 23 | Over | $95,250 |
| | | Healthcare Social Workers | 92 | 28% | 21 | 27 | Over | $44,570 |
| | High | Rehabilitation Counselors | 0 | 0% | 12 | 17 | No Program | $36,300 |
| | | Occupational Therapists | 0 | 0% | 14 | 17 | No Program | $68,880 |
| | | Community & Social Service Specialists, All Other | 19 | 0% | 10 | 15 | Over | $33,720 |
| | | Education Administrators, Elementary & Secondary | 53 | 100% | 13 | 22 | Over | $76,720 |
| | | Ed, Guidance, School, & Vocational Counselors | 49 | 100% | 12 | 20 | Over | $46,810 |
| | | Speech-Language Pathologists | 54 | 50% | 12 | 16 | Over | $66,170 |
| PhD or Prof Degree | Very-High | Dentists, General | 0 | 0% | 10 | 15 | No Program | $129,470 |
| | | Family and General Practitioners | 0 | 0% | 9 | 15 | No Program | $181,320 |
| | | Physicians/Surgeons, Other | 0 | 0% | 37 | 54 | No Program | NA |
| | | Veterinarians | 0 | 0% | 12 | 15 | No Program | $66,670 |
| | | Lawyers | 86 | 95% | 51 | 70 | Over | $71,670 |
| | | Physical Therapists | 81 | 100% | 48 | 62 | Over | $73,080 |
| | | Pharmacists | 66 | 97% | 24 | 36 | Over | $113,500 |
| | High | Chiropractors | 0 | 0% | 4 | 6 | No Program | $57,490 |
| | | Optometrists | 0 | 0% | 6 | 9 | No Program | $96,350 |
| | | Psychiatrists | 0 | 0% | 4 | 6 | No Program | $157,910 |
| | | Surgeons | 0 | 0% | 4 | 7 | No Program | NA |
| | | Clinical Counseling & School Psychologists | 311 | 2% | 9 | 13 | Over | $51,640 |
| | | Math Science Teachers* | 118 | 6% | 4 | 5 | Over | $52,250 |
| | | Psychology Teachers* | 331 | 1% | 4 | 6 | Over | $19,150 |
| | | Health Teachers* | 484 | 30% | 5 | 6 | Over | $56,790 |
| | | Engineering Teachers* | 534 | 1% | 4 | 5 | Over | $71,090 |

*Source: MTDLI 2015-2025 occupational employment projections. OCHE, RMC, and CC graduate data. Very-high demand represents the top 10% of occupations with the most total job openings. High-demand represents the top 25%. College supply is average number of graduate from programs tied to the occupation over the last three academic years. Education requirements from U.S. DOL. Lower bound is the sum of growth openings and 53% of replacement openings. *=Postsecondary teacher*

All of the areas for new program development among graduate degrees are in healthcare. The other high-demand occupations requiring a graduate degree have training programs in Montana with the capacity to fill projected demand. However, these training programs may not be offering the type of degree typically required to enter the occupation. For example, Montana colleges have produced an average of 44 graduates per year who can work as mental health counselors, which is enough to meet

## How do graduates choose which jobs to fill?

Students choose their field of study and future jobs according to their interests and knowledge about how those interests are fulfilled in a variety of jobs. After graduation, workers make career decisions based on wage and benefit packages, interest in the mission of the organization, and work-life balance. However, we can assume that if a graduate is qualified for multiple jobs, more graduates will choose the higher paying job than the lower paying job. Therefore, double-counting the graduates as worker supply for multiple occupations likely results in an accurate measure of worker supply for high-paying occupation, but an overestimate of supply for low-paying jobs.

demand for the occupation. However, only about 30% of these graduates hold a master's degree. Employers looking to hire individuals with a master's in mental health counselling may have a difficult time finding workers. **Figure 3.6** shows the average annual supply from Montana colleges over the last three academic years, and the percentage of those graduates who have the typical education level required to enter the occupation.

Lawyers, pharmacists, and physical therapists are all in very-high demand relative to other occupations requiring the same level of education. The education system has historically produced enough graduates with the required degree in these fields to meet projected demand. To the extent that employers are having a difficult time hiring these occupations, the issue is likely with graduate retention and distribution in Montana -- not capacity of the university system.

**Figures 3.7** and **3.8** display the results from the supply and demand analysis for the other occupations requiring at least some post-secondary education. **Figure 3.7** displays all high-demand occupations that typically require a bachelor's degree. **Figure 3.8** shows high-demand occupations that require some postsecondary education, but less than a bachelor's degree.

The nursing profession has garnered a lot of attention nationally, and has been the target of a number of workforce development efforts in Montana. Nursing is the largest occupation in the rapidly growing healthcare industry, and has the most projected job openings of any occupation typically requiring a bachelor's degree in Montana. Ensuring Montana has an adequate supply of well-trained nurses to meet the demands of the aging population has become increasingly important to educators and policy makers. Montana colleges have increased their production of registered nurses over the last few years in response to demand. Over the last five years, colleges have increased their registered nursing capacity by 42%. Now, an average of 513 students graduate from registered nursing programs in Montana each year.[19] This production is greater than the estimated openings, suggesting Montana's colleges have the capacity to meet employer demand in registered nursing. However, because the growth in capacity is relatively recent, there are likely a number of unfilled registered nursing openings resulting from prior years of undersupply. It may take years of sustained production above demand in order to fill the backlog.

Montana colleges have recently developed the capacity to meet estimated demand for registered nurses in the state. However, in order to meet demand, employers need to hire associate degree and bachelor's degree registered nurses.

19 *registered nurse production excludes graduates with a master's in registered nursing, who are trained to become nurse practitioners.*

FIGURE 3.7

## SUPPLY AND DEMAND ANALYSIS FOR HIGH-DEMAND OCCUPATIONS TYPICALLY REQUIRING A BACHELOR'S DEGREE

| Demand | Occupation | Annual Supply | | Annual Demand | | GAP | Montana Median Wage |
|---|---|---|---|---|---|---|---|
| | | College Supply | % with Bachelor's | Lower Bound | Total Openings | | |
| Very High | Business Operations Specialists | 0 | 0% | 48 | 65 | No Program | $53,960 |
| | Substitute Teachers | 0 | 0% | 41 | 68 | No Program | $21,940 |
| | HR Specialists | 11 | 0% | 29 | 45 | Under | $47,930 |
| | Personal Financial Advisors | 44 | 100% | 30 | 50 | Equal | $96,730 |
| | Accountants and Auditors | 166 | 98% | 116 | 157 | Over | $56,960 |
| | Loan Officers | 44 | 100% | 30 | 41 | Over | $59,640 |
| | Registered Nurses | 513 | 56% | 334 | 445 | Over | $60,720 |
| | Civil Engineers | 79 | 100% | 38 | 58 | Over | $69,260 |
| | Child/Family/School Social Workers | 92 | 100% | 33 | 49 | Over | $34,030 |
| | Elementary School Teachers* | 238 | 100% | 66 | 107 | Over | $48,550 |
| | Medical & Health Service Managers | 132 | 70% | 38 | 53 | Over | $80,350 |
| | Computer Programmers | 156 | 87% | 34 | 51 | Over | $60,440 |
| | Coaches and Scouts | 178 | 98% | 33 | 57 | Over | $23,260 |
| | Middle School Teachers* | 245 | 100% | 37 | 60 | Over | $55,890 |
| | General & Operations Managers | 804 | 90% | 122 | 177 | Over | $78,960 |
| | Secondary School Teachers* | 1,118 | 100% | 48 | 83 | Over | $48,460 |
| | Cost Estimators | 833 | 91% | 40 | 55 | Over | $51,380 |
| | Managers, All Other | 1,738 | 94% | 34 | 58 | Over | $68,290 |
| High | Purchasing Agents | 0 | 0% | 17 | 26 | No Program | $48,310 |
| | Compliance Officers | 0 | 0% | 14 | 20 | No Program | $53,020 |
| | Clergy | 2 | 100% | 18 | 25 | Under | $35,430 |
| | Medical & Clinical Lab Technologists | 8 | 100% | 18 | 24 | Under | $59,930 |
| | Training & Development Specialists | 11 | 0% | 17 | 24 | Under | $47,510 |
| | Graphic Designers | 22 | 12% | 18 | 27 | Equal | $36,420 |
| | PR & Fundraising Managers | 33 | 100% | 14 | 26 | Over | $75,470 |
| | Substance Abuse & Behavior Disorder Counselors | 44 | 63% | 20 | 26 | Over | $38,550 |
| | Financial Managers | 44 | 100% | 17 | 26 | Over | $92,140 |
| | Computer Systems Analysts | 84 | 20% | 20 | 24 | Over | $64,330 |
| | Mental Health & Substance Abuse Social Workers | 92 | 100% | 18 | 25 | Over | $33,200 |
| | Computer Occupations, Other | 81 | 100% | 17 | 21 | Over | $68,230 |
| | Software Developers, Apps | 158 | 58% | 29 | 37 | Over | $72,170 |
| | Market Research Analysts & Specialists | 109 | 83% | 21 | 25 | Over | $50,270 |
| | Social Workers, Other | 92 | 100% | 14 | 21 | Over | $34,630 |
| | Mechanical Engineers | 103 | 100% | 15 | 22 | Over | $74,900 |
| | Foresters | 118 | 97% | 14 | 24 | Over | $52,620 |
| | Ad & Promotion Managers | 143 | 87% | 12 | 25 | Over | $73,180 |
| | Software Developers, Software | 160 | 59% | 21 | 26 | Over | $74,580 |
| | Conservation Scientists | 242 | 98% | 18 | 28 | Over | $58,570 |
| | Computer & Info Systems Managers | 185 | 74% | 16 | 21 | Over | $96,330 |
| | Construction Managers | 730 | 90% | 20 | 32 | Over | $73,460 |
| | Chief Executives | 779 | 90% | 11 | 22 | Over | $103,730 |
| | Sales Managers | 795 | 89% | 12 | 21 | Over | $81,120 |
| | Social & Community Service Managers | 835 | 92% | 14 | 20 | Over | $49,300 |

*Source: MTDLI 2015-2025 occupational employment projections. OCHE, RMC, and CC graduate data. Very-high demand represents the top 10% of occupations with the most total job openings. High-demand represents the top 25%. College supply is the average number of graduate from programs tied to the occupation over the last three academic years. Minimum education requirements set by U.S. DOL. Lower bound of demand is the sum of growth openings and 53% of replacement openings. *=excludes special education and CTE*

FIGURE 3.8

## SUPPLY AND DEMAND ANALYSIS FOR HIGH-DEMAND OCCUPATIONS REQUIRING SOME POSTSECONDARY EDUCATION, BUT LESS THAN A BACHELOR'S DEGREE

| Education Level | Demand Level | Occupation | Annual Supply | | Annual Demand | | GAP | Montana Median Wage |
|---|---|---|---|---|---|---|---|---|
| | | | College Supply | % with Ed Level | Lower Bound | Total Openings | | |
| Some college, no degree | Very High | Teacher Assistants | 6 | 100% | 61 | 103 | Under | $24,160 |
| | High | Bookkeeping, Accounting & Auditing Clerks | 104 | 100% | 47 | 93 | Over | $32,810 |
| Post-secondary non-degree award | Very High | Hairdressers & Cosmetologists | 0 | 0% | 28 | 50 | No Program | $24,990 |
| | | Heavy/ Tractor-Trailer Truck Driver | 0 | 0% | 146 | 207 | No Program | $41,360 |
| | | Nursing Assistants | 3 | 100% | 188 | 256 | Under | $24,360 |
| | | Auto Techs & Mechanics | 29 | 100% | 74 | 118 | Under | $34,660 |
| | | LPN & LVN | 144 | 100% | 71 | 107 | Over | $39,420 |
| | High | Library Techs | 0 | 0% | 12 | 20 | No Program | $25,870 |
| | | Heating & Cooling Mechanics | 2 | 100% | 25 | 30 | Under | $40,530 |
| | | Dental Assistants | 11 | 100% | 27 | 41 | Under | $34,110 |
| | | EMTs & Paramedics | 29 | 100% | 19 | 24 | Over | $29,060 |
| | | Medical Records & HIT | 62 | 100% | 30 | 40 | Over | $31,370 |
| | | Medical Assistants | 103 | 100% | 35 | 46 | Over | $30,580 |
| Associate degree | Very High | Forest/Conservation Techs | 0 | 0% | 43 | 76 | No Program | $31,940 |
| | | Paralegals & Legal Assistants | 10 | 100% | 27 | 37 | Under | $41,840 |
| | | Preschool Teachers* | 38 | 98% | 24 | 38 | Over | $25,900 |
| | | Radiologic Technologists | 45 | 100% | 18 | 25 | Over | $51,350 |
| | | Web Developers | 110 | 100% | 27 | 35 | Over | $47,670 |
| | High | Medical & Clinical Lab Technicians | 0 | 0% | 13 | 18 | No Program | $39,350 |
| | | Vet Technologists & Techs | 0 | 0% | 15 | 17 | No Program | $28,890 |
| | | Dental Hygienists | 15 | 100% | 14 | 21 | Equal | $69,880 |
| | | Respiratory Therapists | 18 | 98% | 13 | 17 | Over | $52,600 |
| | | Physical Therapist Assistants | 25 | 100% | 8 | 10 | Over | $45,020 |
| | | Civil Engineering Techs | 56 | 99% | 8 | 12 | Over | $44,570 |
| | | Computer Network Support Specialists | 175 | 79% | 8 | 11 | Over | $53,710 |

*Source: MTDLI 2015-2025 occupational employment projections. OCHE, RMC, and CC graduate data. Very-high demand represents top 10% of occupations for total job openings. High-demand is the top 25%. Supply is average number of graduates from programs training student for the occupation in the last three years. Minimum education requirements set by U.S. DOL. Lower bound is the sum of projected growth openings and 53% of replacement openings. NA=not available. *=excludes special education*

The typical education level of registered nurses entering the profession has also transitioned over the last few years from an associate to a bachelor's degree. Only about 56% of the registered nursing graduates in Montana graduated with a bachelor's degree. Bachelor's degree registered nursing production alone will not meet employer demand. Employers will need to continue to hire at least some associate registered nurses to meet their workforce needs.

Practical Nursing (LPN) is the occupation with the largest demand among those requiring some post-secondary education, but less than a bachelor's degree. Despite the large number of job openings projected in this occupation, Montana colleges have the capacity to meet demand. There have been an average of 144 LPN graduates per year from Montana colleges over the last three years, which is greater than the 107 projected LPN job openings. All of these graduates hold an associate degree, which is above the education level typically required for LPNs entering the profession. Nursing Assistants (CNAs) are also in high-demand in Montana. The graduate data provided by colleges in this study does not capture CNA supply, so it unclear whether there will be enough CNAs to meet employer demand. The same is true for heavy tractor-trailer truck drivers, and hairdressers and cosmetologists.

If employers find it difficult to fill oversupplied occupations, then the issue is likely one of distribution and retention, not capacity

Outside of healthcare, other high-demand occupations are primarily in education, business, and computer and information science. Many of these occupations fall within STEM fields (Science, Technology, Engineering, and Mathematics). STEM jobs have been the target of workforce development efforts in the state. Excluding healthcare professions, nearly a thousand annual openings are projected for STEM jobs over the next ten years. Every STEM career has an average pay above the statewide average, making them lucrative careers for graduates.[20] The education system in Montana has been able to produce enough graduates to meet projected demand for the STEM occupations listed in **Figures 3.7 and 3.8**. Some of the bachelor's degree STEM occupations in high-demand are accountants, civil engineers, and computer programmers, all of which have programs in Montana with the capacity to train enough workers to meet projected demand.

The statewide supply and demand analysis by occupation suggests the Montana college education system is able to meet the demand for most high-demand occupations in the state. If employers find it difficult to fill these occupations, then the issue is likely one of distribution and retention, not capacity.

## 3.3 Supply and Demand by Program

The last supply and demand analysis evaluates whether the number of graduates from each program is enough to fill worker demand. Unlike the occupational analysis, which included only occupations in high-demand, this analysis includes all occupations that graduates are qualified to fill with their degree. If a program is producing too many graduates to fill available jobs, graduates may have difficulty finding a job. Worse, the graduate may have to accept a position in a field where their degree is not applicable, representing an under-utilization of human capital and possibly reducing the return on the cost of education. Understanding the gaps between supply and demand by program can help identify programs in need of expansion and help establish priorities between programs for the university system.

*20 Montana Employment and Labor Force Projections: Job Growth from 2015 to 2025, MTDLI.*

For most programs, graduates have multiple career options to pursue after graduation because the program is broad enough to meet the training requirements for multiple occupations. For example, business graduates can work as marketing analysts, general managers, or sales associates. The demand for a program is the sum of the demand for all occupations a graduate from the program is qualified to fill. Because all potential occupations are included, the supply and demand analysis by program includes openings that do not require a college degree to fill.[21] The analysis also assumes graduates from a program are the only ones qualified to fill demand for an occupation. Program demand will be overstated in cases were occupations can be filled by graduates from multiple programs because the demand for an occupation is counted once in each program training graduates for the occupation.

**Figure 3.9** summarizes the analysis by program for the 96 different programs offered within the last three academic years at the eighteen colleges included in this study. The bracketed bars represent estimated demand for a program, where the lower bound is total growth and retirement openings, and the upper bound is total projected openings. The colored bars indicate the average annual supply of graduates from each program over the last three academic years. The color of the bars reflects the results from the supply and demand analysis. Blue signifies an undersupplied program, green indicates the program meets estimated workforce demand, and red indicates the program is oversupplied. The amount of the under or oversupply is equal to the difference between the colored bar and the lower, or upper bound of estimated demand, respectively.[22]

About 34% of programs at Montana colleges have not produced enough graduates to meet demand. The construction program is the most significantly undersupplied, followed by the administrative assistant program, and the personal and culinary service program. However, these programs do not need to meet estimated demand because they train graduates to work in occupations that do not require a college degree. Individuals without a post-secondary education can also help fill demand.

Of the 33 programs identified as undersupplied, seven were identified as potential expansion candidates. To be a candidate for expansion, programs must have at least 80% of their demand stemming from occupations requiring a post-secondary education. Additionally, the program must be the primary source of supply for the occupations generating its demand. A number of undersupplied programs train students to work in occupations that can be filled by graduates from a lot of different programs. For example, the demand for public administration, finance, and parks and recreation programs comes primarily from the demand for general and operations managers, which can be filled by graduates from the business program as well. Candidates for program expansion include the three computer and information science programs, automotive technology, mechanic repair technology, social work, and health information technology (HIT) and medical coding.

### POTENTIAL CANDIDATES FOR PROGRAM EXPANSION:

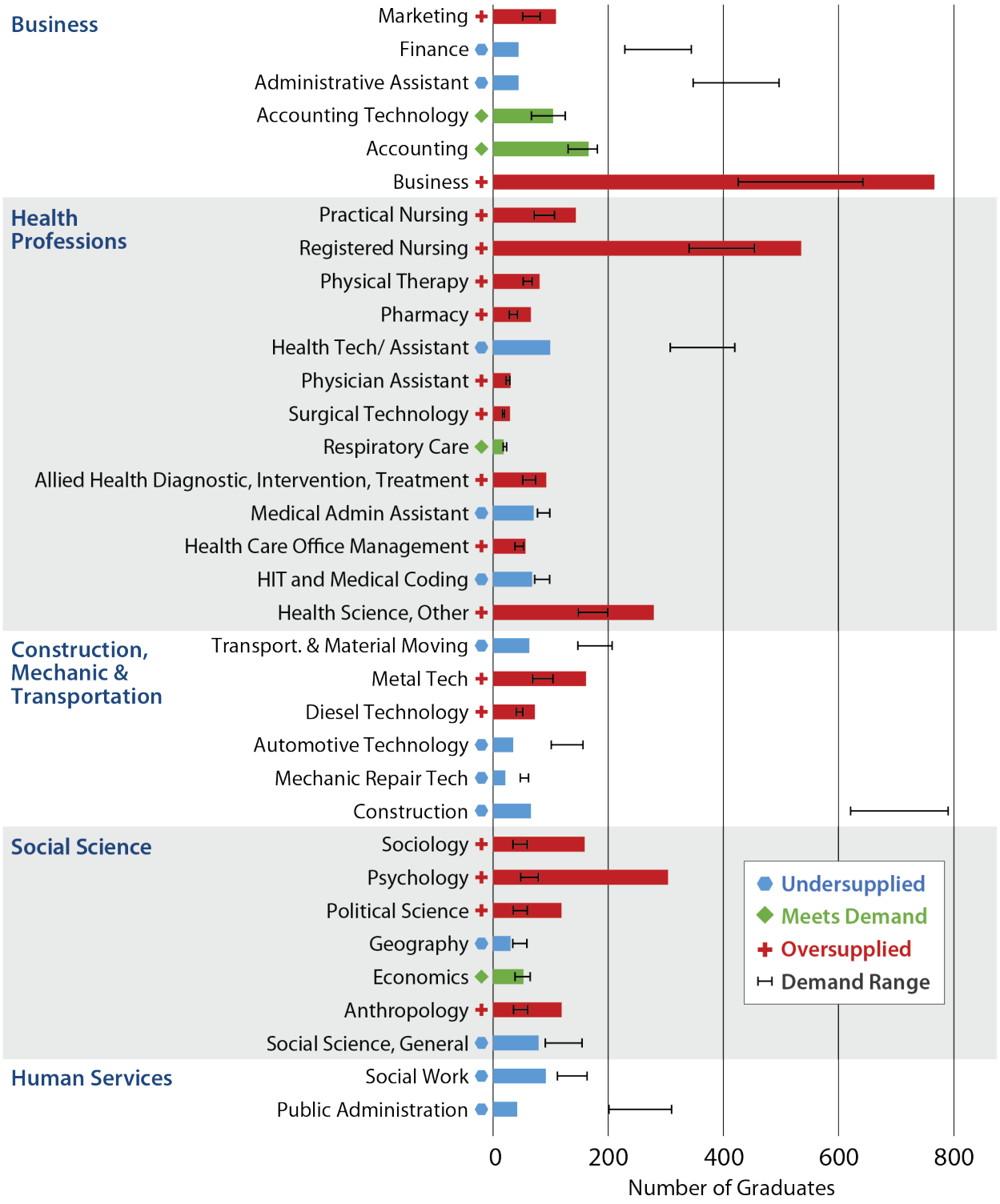
- Information Technology
- Computer Science
- Computer/Info Science, Other
- Automotive Technology
- Mechanic Repair Technology
- Social Work
- HIT and Medical Coding

*21 The percent of demand stemming from occupations requiring a college education are presented in Appendix B.*

*22 The data presented in Figure 3.9 is available in table form in Appendix B.*

FIGURE 3.9

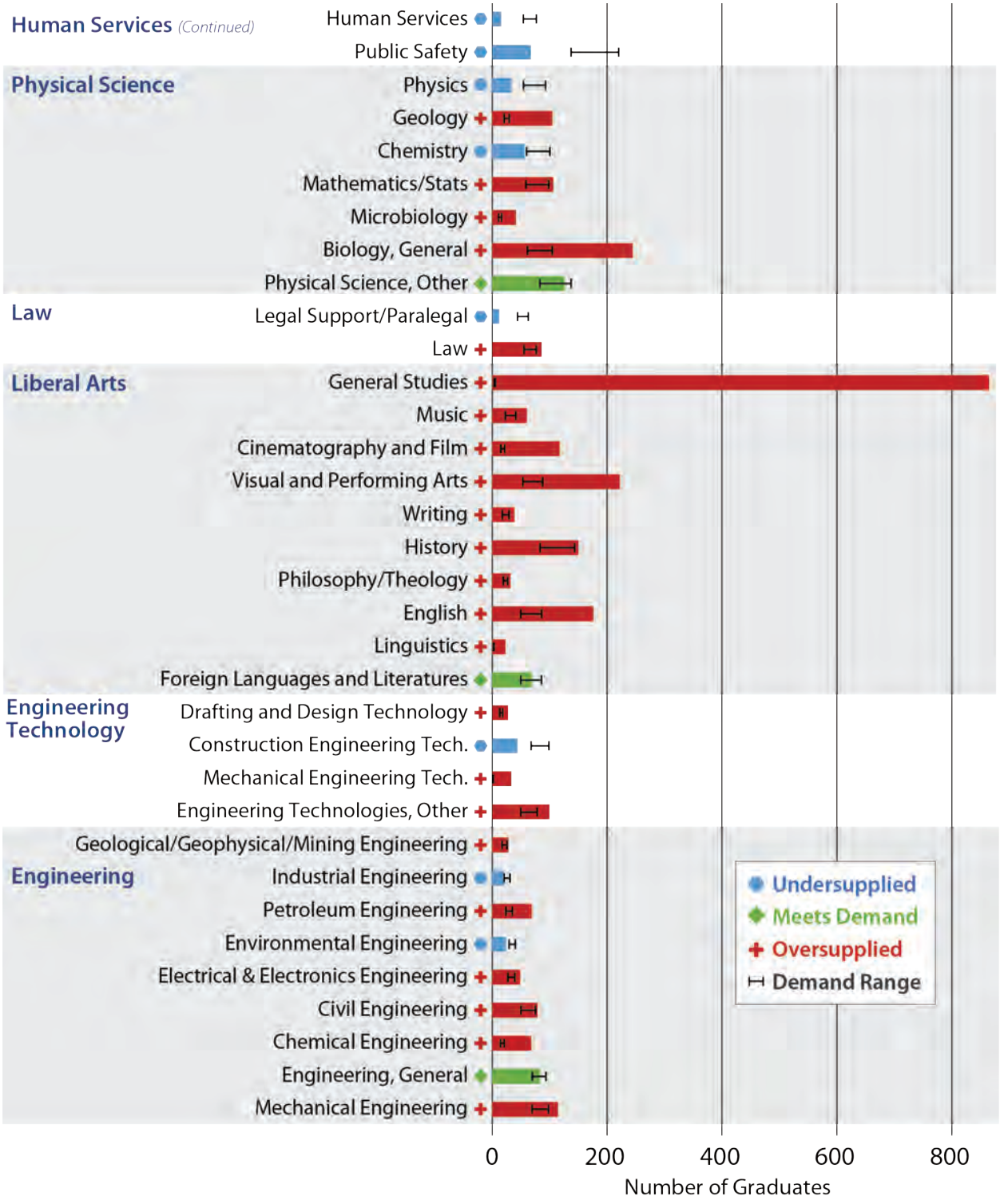
## SUPPLY AND DEMAND ANALYSIS BY PROGRAM




*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC.*
*Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years.*

FIGURE 3.9 (CONTINUED)

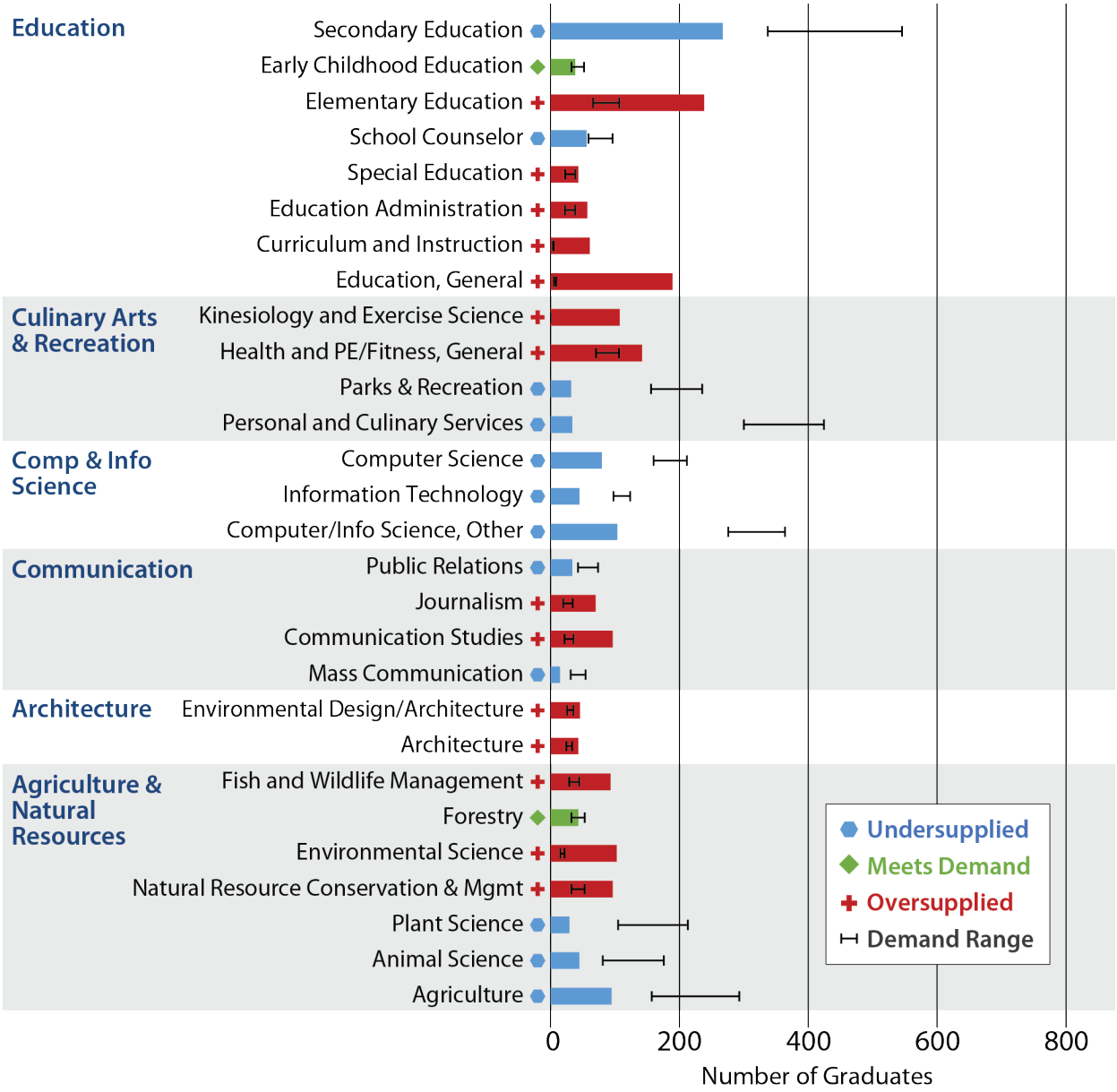
## SUPPLY AND DEMAND ANALYSIS BY PROGRAM




*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC.*
*Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years.*

FIGURE 3.9 (CONTINUED)

## SUPPLY AND DEMAND ANALYSIS BY PROGRAM




*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC.*
*Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years.*

The demand for social work program graduates comes from occupational demand from the following occupations: healthcare social workers; child, family, and school social workers; and mental health and substance abuse social workers. These occupations are in high-demand, and require workers to hold a college degree. No other program can help fill the demand for social workers. While all of these occupations were identified as oversupplied in the occupational analysis, the program analysis suggests Montana colleges do not have the capacity to meet demand because all three occupations rely on graduates from the social work program. The social work program would be good candidate for expansion at the four-year colleges, because a bachelor's degree or higher is typically required to become a social worker.

All three computer and information science programs are undersupplied. Most industries employ IT and computer science occupations, which require some post-secondary education. The prevalence of IT workers is projected to increase, along with other STEM fields. Computer and information science programs are good candidates for expansion primarily at the four-year college level, because most IT and computer science occupations require a bachelor's degree or higher.

**56%** of Montana college programs are **OVERSUPPLIED**. The most severely oversupplied is the **GENERAL STUDIES** program.

Automotive technology and mechanic repair technology programs are good candidates for expansion at the two-year college level. These programs are undersupplied, and they train individuals to work in undersupplied occupations that require a college education. Automotive repair technology trains automotive service technicians, and mechanic repair technology trains heating, air conditioning, and refrigeration mechanics and installers. These programs serve as the primary source of supply for these occupations, and are therefore identified as expansion candidates.

The last program expansion candidate is HIT and medical coding. This program trains individuals to work as medical records and health information technicians, and medical assistants. Both of these occupations are in high-demand, and require a post-secondary award. Therefore, the HIT and medical coding programs is identified as an expansion candidate at the two-year college level.

The health tech/assistant program also meets the criteria for expansion. The demand for this program comes primarily from the demand for Nursing Assistants (CNAs). However, the graduate data does not fully capture the supply of CNAs, and therefore it is unclear if the health tech/ assistant program is able to meet statewide demand.

Montana colleges produce enough graduates to meet expected demand for nine programs, including: forestry; early childhood education; engineering; economics; accounting; and respiratory care. These programs do not have the capacity to meet total demand, but are able to produce enough graduates to fill new job openings and openings due to retirements. Employers of graduates from these programs must also be able to attract workers from other states, workers currently employed in other occupations, or workers outside of the Montana labor force to fill all their projected needs.

Finally, 56% of Montana college programs have produced more graduates than expected demand. Fifty-four of the 96 programs are oversupplied. The oversupplied programs are primarily in communication, liberal arts, education, and social science. Students in oversupplied programs may have a difficult time finding work in Montana after graduation.

Of the programs with an oversupply of graduates, the most severe is in general studies. According to the Bureau of Labor Statistics, there are few occupations that someone with a general studies is prepared to fill. The occupations tied to the general studies program have slow projected growth in Montana. Despite minimal demand, colleges in Montana have produced an average of 865 general studies graduates over the last three academic years, making general studies the largest program among graduates. While the general studies program is designed as a transfer program and may meet demand from students who are unsure of their career interests, students who graduate with a degree in general studies have worse workforce outcomes than the average graduate.

## 3.4 Workforce Outcomes by Program

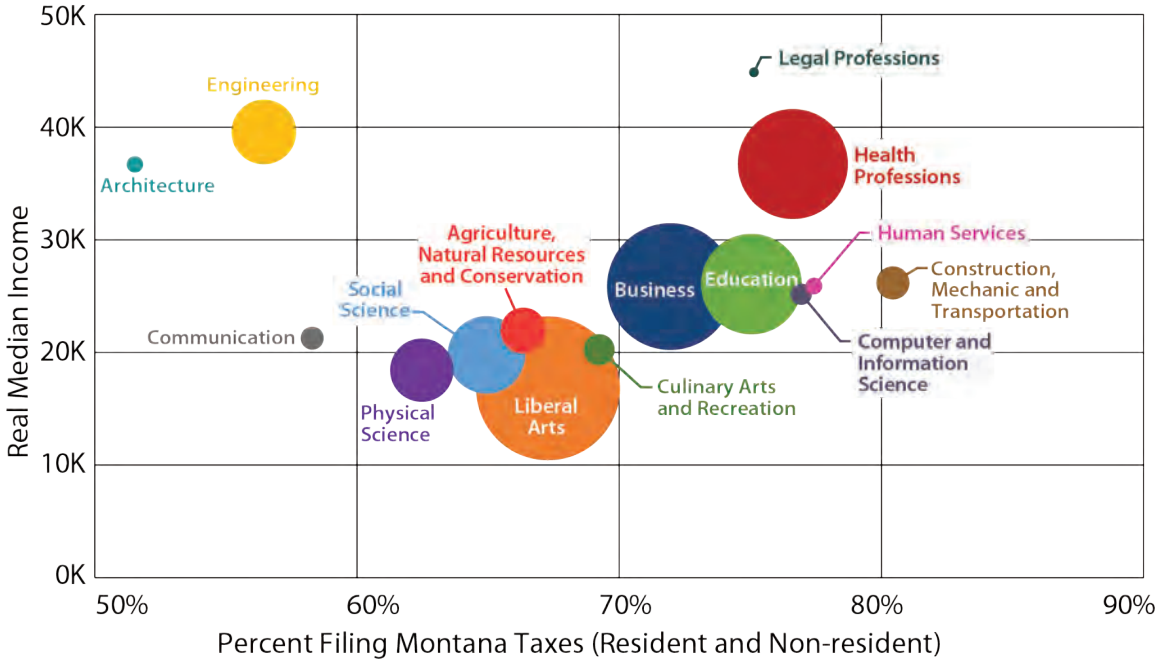
The supply and demand analyses by industry, occupation, and program highlighted different gaps between the types of training provided by Montana colleges and the types of workers demanded by employers. The results from these analyses can help guide colleges making strategic-planning decisions, and students deciding which career to pursue. However, in decisions about program priorities and future careers, it is important to also consider which programs have led to the best workforce outcomes for students in Montana. Employment and wage outcomes by program provide insight into how valuable students from various program are to Montana employers. Presumably, students graduating in undersupplied programs will be able to find a job more quickly and have higher wages than students graduating from oversupplied programs.

**Figure 3.10** shows the workforce outcomes for each of the fifteen program categories. The size of the bubble represents the number of graduates in each program category since 2001. The location of the bubble within the chart provides the median income of graduates one year after graduation on the vertical axis, and the percent of graduates filing Montana income taxes on the horizontal axis. Programs in the upper-right corner of the chart have better workforce outcomes than those in the lower-left corner.

Only Montana income is considered. Graduates not filing income tax returns in Montana may be successfully employed in other states.

FIGURE 3.10

### WORKFORCE OUTCOMES BY PROGRAM CATEGORY ONE YEAR AFTER GRADUATION




*Source: DOR, OCHE, RMC, and CC income data match summarized by MTDLI. Earned income is defined as lines 7, 12, 17, and 18 on the Montana income tax return, not including farm income. Real median income reported in 2015 dollars using the CPI-U.*

Legal professions graduates have the highest median wage of $44,000 one year after graduation. Engineering graduates follow closely behind at $39,000, and then health professions and architecture graduates at $36,000. Specifically, the programs within the health professions driving the high median income are pharmacy ($84,900), physician assistant ($68,600), physical therapy ($58,100), and registered nursing ($45,500) programs. Among the high-income programs, only law and registered nursing also have above-average retention rates in the Montana workforce. Approximately 84% of registered nursing graduates and 73% of law graduates filed income taxes in Montana a year after graduation. Law and registered nursing were both identified as oversupplied in the supply and demand analysis. However, the above-average workforce outcomes suggest graduates from these programs are in-demand in the Montana workforce, and graduates can have successful careers in these fields.

**Law** and **Registered Nursing** graduates have the best workforce outcomes, suggesting they are in high-demand in the Montana workforce.

Physical science ($18,400), social science ($19,800), and liberal arts ($16,800) graduates have the lowest median incomes one year after graduation. These low incomes are also coupled with below-average retention rates in the Montana workforce after graduation. All of the programs in these categories have less than 69% of graduates filing income taxes in Montana one year after graduation. General studies is the only exception, with 75% filing taxes in Montana, but reporting only $14,600 in income. Two-thirds of the programs in these categories were identified as oversupplied by Montana colleges, which is supported by below-average workforce outcomes. These programs may be areas where colleges could lower their capacity.

## 3.4.1 Workforce Outcomes Support Program Expansion Candidates

**Figure 3.11** shows the workforce outcomes for each of the ninety-six detailed programs one year and five years after graduation. The figure also recaps the results from the supply and demand analysis in the earlier section. Programs colored blue are undersupplied, green programs meet estimated demand, and red programs are oversupplied. In general, oversupplied programs tend to have lower income and are less likely to work in Montana after graduation than undersupplied programs.

Programs where it is common for individuals to go on to higher education may have lower reported income levels initially

Computer science and information technology programs were identified as candidates for expansion in the supply and demand analysis by program. Workforce outcomes by program support the conclusion that these programs are undersupplied. While the median income for graduates from these programs is slightly below average, graduates do have above-average retention rates in the Montana labor force, suggesting students can find jobs quickly after graduation. The computer science program has the highest median income ($36,900) of programs in this category and a retention rate of 67% one year after graduation, just 2% below average.

**Workforce outcomes support expansion** of computer and info science programs, social work, mechanic repair technology, and automotive technology programs. HIT and medical coding workforce outcomes do not indicate the program is in high demand relative to other certificate programs.

The social work program is also an expansion candidate, and the workforce outcomes suggest graduates from this program are able to find work in Montana shortly

after graduation. Social work graduates are more likely to stay in Montana after graduation than the average graduate. However, social work graduates only reported $25,900 in income compared to $29,900 across all graduates. In general, social work occupations pay less than the statewide average. As the Montana labor market tightens, employers may need to raise wages to continue to attract qualified social workers.

## FIGURE 3.11
## WORKFORCE OUTCOMES, SUPPLY AND DEMAND ANALYSIS BY PROGRAM

| Program Category | Program | GAP | One Year After | | Five Years After | |
|---|---|---|---|---|---|---|
| | | | % Filing MT taxes | Real Median Income | % Filing MT taxes | Real Median Income |
| Agriculture and Natural Resource | Agriculture | Under | 74% | $22,661 | 70% | $32,259 |
| | Animal Science | Under | 77% | $18,779 | 70% | $27,470 |
| | Plant Science | Under | 66% | $21,965 | 54% | $30,383 |
| | Natural Resource Conservation & Management | Over | 66% | $22,108 | 50% | $34,839 |
| | Environmental Science | Over | 62% | $20,255 | 51% | $32,634 |
| | Forestry | Meets | 64% | $28,752 | 47% | $41,908 |
| | Fish and Wildlife Management | Over | 64% | $21,731 | 47% | $30,796 |
| Architecture | Architecture | Over | 43% | $36,698 | 37% | $45,826 |
| | Environmental Design/Architecture | Over | 62% | $14,540 | 41% | $38,361 |
| Communication | Mass Communication | Under | 64% | $23,380 | 52% | $29,326 |
| | Communication Studies | Over | 56% | $21,270 | 41% | $29,154 |
| | Journalism | Over | 53% | $20,855 | 41% | $30,597 |
| | Public Relations | Under | 70% | $27,490 | 56% | $33,873 |
| Computer/Info Science | Computer/Info Science, Other | Under | 82% | $25,162 | 79% | $39,798 |
| | Information Technology | Under | 85% | $22,045 | 73% | $34,365 |
| | Computer Science | Under | 67% | $36,969 | 54% | $53,184 |
| Culinary Arts and Recreation | Personal and Culinary Services | Under | 80% | $18,554 | 65% | $19,895 |
| | Parks & Recreation | Under | 60% | $20,912 | 51% | $29,809 |
| | Health and PE/Fitness, General | Over | 68% | $18,621 | 53% | $29,627 |
| | Kinesiology and Exercise Science | Over | 70% | $20,260 | 59% | $29,893 |
| Education | Education, General | Over | 74% | $27,216 | 68% | $34,988 |
| | Curriculum and Instruction | Over | 78% | $35,522 | 74% | $39,981 |
| | Education Administration | Over | 83% | $48,773 | 78% | $57,407 |
| | Special Education | Over | 77% | $26,833 | 67% | $30,602 |
| | School Counselor | Under | 81% | $34,169 | 72% | $38,106 |
| | Elementary Education | Over | 78% | $21,388 | 68% | $29,280 |
| | Early Childhood Education | Meets | 89% | $19,416 | 83% | $21,762 |
| | Secondary Education | Under | 66% | $26,072 | 60% | $33,479 |
| Engineering | Mechanical Engineering | Over | 50% | $38,525 | 36% | $57,010 |
| | Engineering, General | Meets | 56% | $45,103 | 46% | $60,698 |
| | Chemical Engineering | Over | 38% | $28,725 | 27% | $55,793 |
| | Civil Engineering | Over | 67% | $41,869 | 57% | $53,834 |
| | Electrical and Electronics Engineering | Over | 57% | $41,350 | 43% | $59,784 |
| | Environmental Engineering | Under | 50% | $37,908 | 39% | $52,189 |
| | Petroleum Engineering | Over | 17% | $84,242 | 12% | $137,396 |
| | Industrial Engineering | Under | 38% | $33,804 | 29% | $43,276 |

*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC. Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years. Income reported in 2015 dollars using the CPI-U.*

Over Oversupplied  Meets Meets Demand  Under Undersupplied

## FIGURE 3.11 (CONTINUED)

## WORKFORCE OUTCOMES, SUPPLY AND DEMAND ANALYSIS BY PROGRAM

| Program Category | Program | GAP | One Year After | | Five Years After | |
|---|---|---|---|---|---|---|
| | | | % Filing MT taxes | Real Median Income | % Filing MT taxes | Real Median Income |
| Engineering (Continued) | Geological/Geophysical/Mining Engineering | Over | 35% | $34,618 | 26% | $57,360 |
| Engineering Technologies | Engineering Technologies, Other | Over | 80% | $31,219 | 76% | $44,571 |
| | Mechanical Engineering Technology | Over | 63% | $43,225 | 53% | $53,224 |
| | Construction Engineering Technology | Under | 64% | $39,574 | 62% | $50,866 |
| | Drafting and Design Technology | Over | 79% | $29,607 | 73% | $37,859 |
| Liberal Arts | Foreign Languages and Literatures | Meets | 60% | $18,384 | 43% | $26,889 |
| | Linguistics | Over | 55% | $13,921 | 36% | $21,273 |
| | English | Over | 63% | $16,816 | 46% | $24,482 |
| | Writing | Over | 51% | $18,799 | 41% | $30,853 |
| | General Studies | Over | 75% | $14,640 | 65% | $26,288 |
| | Visual and Performing Arts | Over | 68% | $17,594 | 50% | $22,909 |
| | Cinematography and Film | Over | 56% | $17,633 | 35% | $23,026 |
| | Music | Over | 65% | $16,480 | 48% | $25,068 |
| | Philosophy/Theology | Over | 54% | $16,890 | 42% | $25,452 |
| | History | Over | 63% | $18,466 | 46% | $27,243 |
| Law | Law | Over | 73% | $44,876 | 68% | $60,321 |
| | Legal Support/Paralegal | Under | 87% | $23,492 | 81% | $24,004 |
| Physical Science | Physical Science, Other | Meets | 64% | $17,972 | 42% | $29,968 |
| | Biology, General | Over | 66% | $18,424 | 49% | $29,494 |
| | Microbiology | Over | 67% | $22,176 | 41% | $38,354 |
| | Mathematics/Stats | Over | 59% | $21,920 | 43% | $35,861 |
| | Chemistry | Under | 55% | $21,011 | 42% | $32,496 |
| | Geology | Over | 60% | $24,474 | 45% | $36,856 |
| | Physics | Under | 61% | $20,947 | 41% | $22,995 |
| Human Services | Public Safety | Under | 85% | $27,380 | 81% | $39,713 |
| | Human Services | Under | 84% | $22,830 | 73% | $24,548 |
| | Public Administration | Under | 71% | $34,088 | 56% | $47,316 |
| | Social Work | Under | 74% | $25,900 | 61% | $32,596 |
| Social Science | Social Science, General | Under | 69% | $20,635 | 57% | $28,442 |
| | Anthropology | Over | 61% | $17,405 | 46% | $23,286 |
| | Psychology | Over | 68% | $18,803 | 51% | $28,648 |
| | Economics | Meets | 61% | $21,309 | 52% | $37,539 |
| | Geography | Under | 60% | $22,076 | 51% | $29,945 |
| | Political Science | Over | 60% | $19,791 | 46% | $32,482 |
| | Sociology | Over | 68% | $22,005 | 54% | $29,388 |
| Construction, Mechanic and Transportation | Construction | Under | 81% | $23,450 | 78% | $30,987 |
| | Mechanic Repair Tech | Under | 84% | $25,890 | 77% | $33,090 |
| | Automotive Technology | Under | 83% | $26,178 | 79% | $36,087 |
| | Diesel Technology | Over | 73% | $31,789 | 69% | $41,660 |
| | Metal Tech | Over | 84% | $26,513 | 81% | $35,772 |
| | Transportation and Material Moving | Under | 80% | $22,519 | 65% | $30,419 |

*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC. Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years. Income reported in 2015 dollars using the CPI-U.*

Over Oversupplied  Meets Meets Demand  Under Undersupplied

FIGURE 3.11 (CONTINUED)

## WORKFORCE OUTCOMES, SUPPLY AND DEMAND ANALYSIS BY PROGRAM

| Program Category | Program | GAP | One Year After | | Five Years After | |
|---|---|---|---|---|---|---|
| | | | % Filing MT taxes | Real Median Income | % Filing MT taxes | Real Median Income |
| Health Professions | Health Science, Other | Over | 67% | $23,168 | 56% | $37,885 |
| | HIT and Medical Coding | Under | 81% | $23,826 | 75% | $25,737 |
| | Health Care Office Management | Over | 78% | $28,483 | 72% | $31,027 |
| | Medical Admin Assistant | Under | 87% | $20,378 | 81% | $23,074 |
| | Allied Health Diagnostic, Intervention, Treatment | Over | 79% | $33,857 | 73% | $41,473 |
| | Respiratory Care | Meets | 77% | $36,732 | 63% | $42,296 |
| | Surgical Technology | Over | 85% | $36,085 | 77% | $32,427 |
| | Physician Assistant | Over | 40% | $68,673 | 41% | $88,313 |
| | Health Tech/ Assistant | Under | 85% | $25,491 | 75% | $29,130 |
| | Pharmacy | Over | 51% | $84,907 | 48% | $101,039 |
| | Physical Therapy | Over | 28% | $58,108 | 40% | $55,872 |
| | Registered Nursing | Over | 84% | $45,543 | 74% | $49,599 |
| | Practical Nursing | Over | 91% | $25,586 | 80% | $33,273 |
| Business | Business | Over | 70% | $25,848 | 58% | $37,825 |
| | Accounting | Meets | 71% | $31,439 | 62% | $45,679 |
| | Accounting Technology | Meets | 86% | $20,940 | 82% | $26,430 |
| | Administrative Assistant | Under | 88% | $19,094 | 80% | $21,514 |
| | Finance | Under | 72% | $29,131 | 66% | $43,095 |
| | Marketing | Over | 71% | $22,775 | 64% | $31,563 |

*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC. Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years. Income reported in 2015 dollars using the CPI-U.*

Over Oversupplied  Meets Meets Demand  Under Undersupplied

Mechanic repair technology and automotive technology were identified as expansion candidates at the two-year college level. The workforce outcomes for graduates from these programs support that conclusion. Both of these programs have over 80% retention rates in the Montana workforce one year after graduation, which is consistent with programs commonly offered at two-year colleges. Median incomes for mechanic repair and automotive technology graduates are above the median income for associate degree earners.

The HIT and medical coding program is classified as an expansion candidate, but the workforce outcomes don't suggest employers are demanding HIT graduates more than graduates from other certificate programs. The income reported by HIT graduates is similar to other certificate programs, and retention one year after graduation is slightly less than average. Based on the workforce outcomes, HIT and medical coding programs may not be as urgent of an expansion priority among two-year colleges.

## SECTION 3 HIGHLIGHTS

- Montana colleges have the capacity to meet demand for 67% of high-demand occupations in the state. If employers find it difficult to fill these occupations, then the issue is likely about distribution and retention, not capacity (**Figure 3.4**).

- Montana colleges have the capacity to meet estimated demand for registered nurses in the state. However, in order to meet demand employers will need to hire both associate-trained and bachelor-trained registered nurses (**Figure 3.7**).

- About a 21% of high-demand occupations are not associated with any programs currently offered at colleges included in this study, mostly in highly-skilled healthcare occupations (**Figure 3.4**).

- Good candidates for program expansion among four-year programs are social work, computer science, and information technology programs (**Figure 3.9**).

- Good candidates for expansion among two-year programs include: mechanic repair and automotive technology; and HIT and medical coding programs (**Figure 3.9**).

- 56% of Montana College programs are oversupplied. The oversupplied programs are primarily in communication, liberal arts, education, and social science (**Figure 3.9**). Students in oversupplied programs tend to have below-average workforce outcomes in Montana.

- General studies is the largest program at Montana colleges, and it has produced far more graduates than expected demand (**Figure 3.9**). This oversupply has led to below-average workforce outcomes for general studies graduates (**Figure 3.11**).

SECTION 4:

# REGIONAL SUPPLY & DEMAND ANALYSIS

As a large state with a dispersed population, Montana's workforce development efforts must focus on ensuring our training system can produce enough workers to meet business needs in each region of the state, not just for the state as a whole. Montana colleges have the capacity to meet demand for the majority of occupations requiring a college degree. However, there may still be areas of the state where it is difficult for employers to find qualified workers. Mismatches in the geographical distribution of the supply and demand of workers create labor market frictions, which can cause the unemployment rate to rise and hamper business productivity.

The geographical distribution of graduates will not perfectly match the distribution of workforce demand because businesses' workforce needs are always evolving, and colleges often develop specializations that lead to the concentration of programs in a particular region. However, identifying and resolving distribution mismatches that persist over time can be effective in improving the efficiency of the Montana labor market. The final research question of this report seeks to understand the contribution of colleges to their local region, to identify regional differences in the supply and demand of graduates, and to determine how graduate migration patterns help to fill those gaps.

FIGURE 4.1

## MONTANA REGIONS AND COLLEGE LOCATIONS

## 4.1 Colleges are an Important Resource for Local Employers

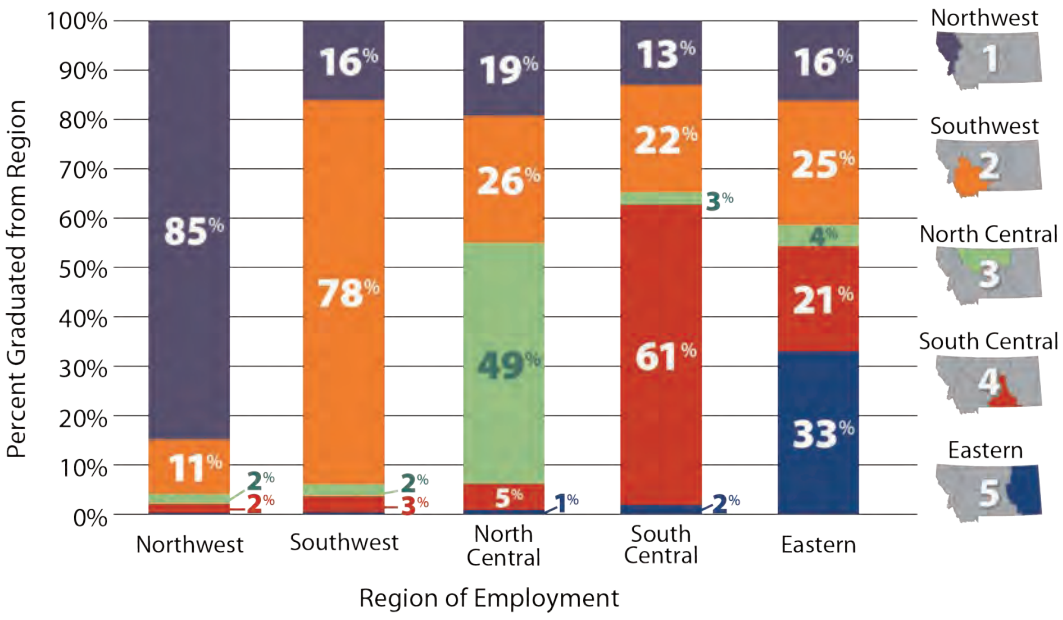
The colleges included in this study are located in every region of the state, as shown in **Figure 4.1**. The western regions produce the most graduates, primarily from the state's flagship universities in Missoula and Bozeman. The Northwest and Southwest regions are also projected to have the largest demand for workers. Employment in both regions is estimated to grow at 1.2%. South Central employment is estimated to grow slightly slower, at 1.1%. Employment in the Eastern and North Central regions are estimated to grow slower than the statewide average, at 0.9% and 0.6% respectively.

Colleges in each region provide an important source of labor for local employers. Employers tend to hire workers from nearby colleges, and graduates tend to work near their college of graduation. This is particularly true in the western regions, where employers have access to a large pool of local graduates from the state's flagship universities. Eighty-five percent of graduates working in the Northwest graduated in that region, and 78% of graduates working in the Southwest graduated from institutions in the Southwest. The other regions of the state do not have access to a large local pool of graduates; therefore, more of their graduate workforce comes from other regions. **Figure 4.2** shows where graduates working in each region went to college.

FIGURE 4.2

### WHERE DID GRADUATES WORKING IN EACH REGION GO TO COLLEGE?

By Region of Employment one Year after Graduation, 2010-2015



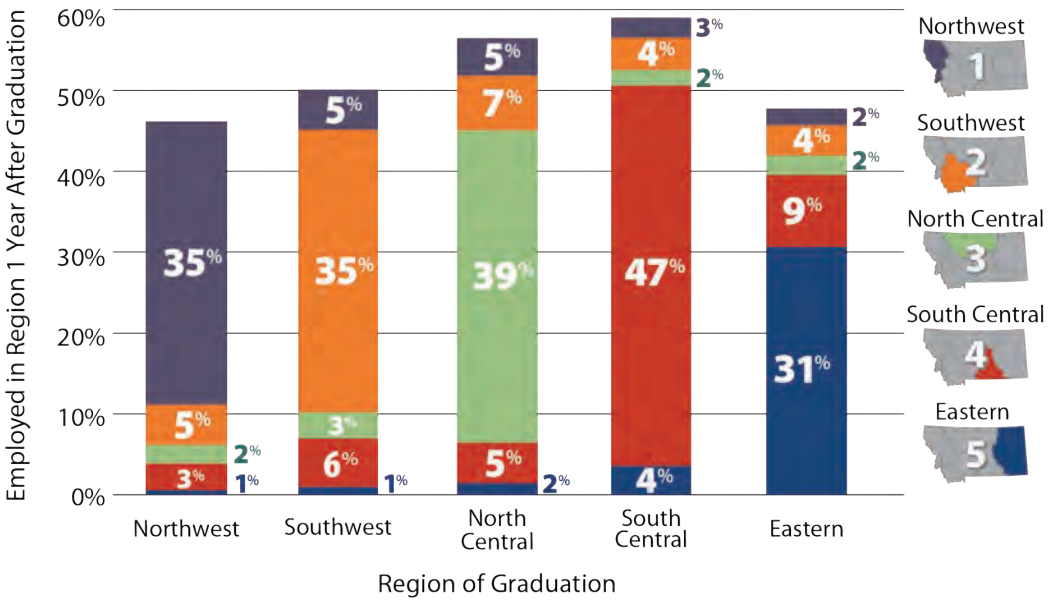

*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Region 5 data not available before 2010.*

Most graduates who work in Montana find employment in the region where they graduated. **Figure 4.3** shows the migration of graduates by region one year after graduation. Higher retention of graduates in the local region suggests the colleges in that region are able to meet local business needs.

FIGURE 4.3

## WHERE DO GRADUATES MOVE ONE YEAR AFTER GRADUATION?

By Region of Graduation, 2001-2015




*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Does not add to 100% because not all graduates from a region entered the Montana workforce, and not all employers record their location. Region 5 data not available before 2010.*

The South Central region, where Billings is located, has the highest graduate retention. Forty-seven percent of graduates from that region remain there to work one year after graduation. The highest percentage of out-migration occurs in the Eastern region. About 9% of graduates from that region move to the Billings area for work, and another 8% move to the other three regions of the state. Graduates from the Eastern region are also the least likely to be employed by a Montana business one year after graduation. Many of these graduates may still be living in Montana, but are working for employers across the border in North Dakota or Wyoming.

## 4.2 Regional Supply and Demand Analysis by Program

While colleges provide an important source of labor for local employers, the rural regions in Montana are less likely to have the necessary workforce to meet employer's needs. **Figure 4.4** shows the supply and demand analysis by program in each of the five regions. Programs colored blue are undersupplying regional demand, green indicates the program meets regional demand, red means oversupplied, and white indicates the program is not offered at colleges in the region. Program supply includes only graduates from colleges in the region, and demand is measured using regional employment projections.

The Northwest and Southwest regions have the greatest number of oversupplied programs because most colleges are located in those regions, and the programs are designed to fill statewide demand. All of the 96 programs offered at Montana colleges are available in either the Northwest or Southwest regions. Colleges in the South Central region also have a wide variety of program offerings. However, the more rural North Central and Eastern regions have limited program offerings. Only 38% of

programs are offered in the North Central region, and only 27% of programs are offered in the East. Furthermore, all but three of the programs available in the Eastern region are not supplying enough graduates to meet employer demand. In order for employers in the Eastern region to fill their workforce needs, they will need to recruit workers from other regions of the state.

While Montana colleges have the capacity to meet statewide demand for most programs, there is **more significant unmet demand in the state's rural regions.**

A number of programs are only offered in a few regions. All engineering and architecture graduates come from the Southwest region, primarily from Montana State University. Similarly, all pharmacy and physical therapy graduates come from the University of Montana in the Northwest region. Centralized programs are designed to fill statewide workforce demand, and therefore should not be compared to regional demand as shown in **Figure 4.4**. However, the regional analysis is still useful for centralized programs because it highlights the geographical distribution mismatch in supply and demand. In order for centralized programs to meet statewide demand, graduates from these program must be willing to move to other areas of the state for work. If the graduate workforce is not mobile, then employers in other areas of the state will not have access to the workforce they need.

## FIGURE 4.4
## REGIONAL SUPPLY AND DEMAND ANALYSIS BY PROGRAM

| Program Category | Program | North West 1 | South West 2 | North Central 3 | South Central 4 | Eastern 5 |
|---|---|---|---|---|---|---|
| Agriculture and Natural Resource | Agriculture | | Under | Meets | Meets | Under |
| | Animal Science | | Under | | | Under |
| | Plant Science | | Under | | | |
| | Natural Resource Conservation & Mgmt | Over | Over | | | |
| | Environmental Science | Over | Over | | Over | |
| | Forestry | Over | | | Meets | |
| | Fish and Wildlife Management | Over | Over | | | |
| Architecture | Architecture | | Over | | | |
| | Environmental Design/Architecture | | Over | | | |
| Communication | Mass Communication | Under | | | Over | |
| | Communication Studies | Over | Meets | Under | Over | |
| | Journalism | Over | | | | |
| | Public Relations | | Under | | Over | |
| Computer/Info Science | Computer/Info Science, Other | Under | Under | Under | Under | Under |
| | Information Technology | Meets | | Over | Under | |
| | Computer Science | Under | Under | | Under | |
| Culinary Arts and Recreation | Personal and Culinary Services | Under | | | | |
| | Parks & Recreation | Under | | | Under | |
| | Health and PE/Fitness, General | Over | Under | Under | Over | |
| | Kinesiology and Exercise Science | | Over | | Over | |

Over Oversupplied  Meets Meets Demand  Under Undersupplied

*Source: MTDLI 2015-2025 occupational employment projections by region and graduate data from OCHE, CC and RMC. Demand is sum of regional demand for all occupations a graduate from the program could fill. Supply is average over last three academic years from colleges within the region.*

## FIGURE 4.4 (CONTINUED)

## REGIONAL SUPPLY AND DEMAND ANALYSIS BY PROGRAM

| Program Category | Program | North West 1 | South West 2 | North Central 3 | South Central 4 | Eastern 5 |
|---|---|---|---|---|---|---|
| Education | Education, General | Over | Over | Over | Over | |
| | Curriculum and Instruction | Over | Over | | Over | |
| | Education Administration | Over | Over | | Over | |
| | Special Education | Under | | | Over | Under |
| | School Counselor | Meets | | Over | Over | |
| | Elementary Education | Under | Over | Over | Over | Under |
| | Early Childhood Education | Under | Over | | Under | Over |
| | Secondary Education | Under | Over | Under | Meets | Under |
| Engineering | Mechanical Engineering | | Over | | | |
| | Engineering, General | | Over | | | Under |
| | Chemical Engineering | | Over | | | |
| | Civil Engineering | | Over | | | |
| | Electrical and Electronics Engineering | | Over | | | |
| | Environmental Engineering | | Over | | | |
| | Petroleum Engineering | | Over | | | |
| | Industrial Engineering | | Over | | | |
| | Geological/Geophysical/Mining Engineering | | Over | | | |
| Engineering Technologies | Engineering Technologies, Other | Over | Meets | Over | Over | |
| | Mechanical Engineering Technology | | Over | | | |
| | Construction Engineering Technology | | Over | Under | | |
| | Drafting and Design Technology | Over | Over | Over | Under | |
| Liberal Arts | Foreign Languages and Literatures | Over | Over | | Under | |
| | Linguistics | Over | Under | | | |
| | English | Over | Over | | Under | |
| | Philosophy/Theology | Over | Over | | Under | |
| | History | Over | Over | | Under | |
| | Writing | Over | Meets | | Over | |
| | Visual and Performing Arts | Over | Over | Over | Over | |
| | Cinematography and Film | Over | Over | | | |
| | Music | Over | Over | | Over | Under |
| | General Studies | Over | Over | Over | Over | Over |
| Law | Law | Over | | | | |
| | Legal Support/Paralegal | Under | Under | Under | | |
| Physical Science | Physical Science, Other | Under | Over | Under | Under | |
| | Biology, General | Over | Over | Under | Meets | |
| | Microbiology | Over | Over | | Over | |
| | Mathematics/Stats | Over | Over | Under | Under | |
| | Chemistry | Meets | Over | | Under | |
| | Geology | Over | Over | | Under | |
| | Physics | Under | Over | | | |

Over Oversupplied  Meets Meets Demand  Under Undersupplied

*Source: MTDLI 2015-2025 occupational employment projections by region and graduate data from OCHE, CC and RMC. Demand is sum of regional demand for all occupations a graduate from the program could fill. Supply is average over last three academic years from colleges within the region.*

## FIGURE 4.4 (CONTINUED)

## REGIONAL SUPPLY AND DEMAND ANALYSIS BY PROGRAM

| Program Category | Program | North West 1 | South West 2 | North Central 3 | South Central 4 | Eastern 5 |
|---|---|---|---|---|---|---|
| Human Services | Public Safety | Under | Under | Under | Meets | Meets |
| | Human Services | Under | | | Meets | |
| | Public Administration | Under | Under | Under | Under | |
| | Social Work | Over | Under | | | |
| Social Science | Social Science, General | Meets | Over | | | |
| | Anthropology | Over | Under | | | |
| | Economics | Over | Over | | Under | |
| | Geography | Over | | | | |
| | Political Science | Over | Over | | Meets | |
| | Psychology | Over | Over | | Over | |
| | Sociology | Over | Over | | Over | |
| Construction, Mechanic and Transportation | Construction | Under | Under | Under | Under | Under |
| | Mechanic Repair Tech | Meets | Under | | Under | |
| | Automotive Technology | Under | Under | Under | Under | Under |
| | Diesel Technology | Under | Over | Over | Over | Under |
| | Metal Tech | Over | Over | Over | Meets | Under |
| | Transportation and Material Moving | Under | Under | Under | Under | Under |
| Health Professions | Health Science, Other | Over | Over | | Meets | Under |
| | HIT and Medical Coding | Under | Under | Over | Under | Under |
| | Health Care Office Management | Over | | Over | Over | |
| | Medical Admin Assistant | Under | Over | Over | Under | Under |
| | Health Diagnostic, Intervention, Treatment | Over | Under | Over | Over | |
| | Respiratory Care | Over | | Over | | |
| | Surgical Technology | Over | | Over | | |
| | Physician Assistant | | | | Over | |
| | Health Tech/ Assistant | Under | Under | Meets | | Under |
| | Pharmacy | Over | | | | |
| | Physical Therapy | Over | | | | |
| | Registered Nursing | Under | Over | Over | Under | Over |
| | Practical Nursing | Over | Over | Over | Over | Under |
| Business | Business | Over | Over | Meets | Over | Under |
| | Accounting | Over | Under | | Over | |
| | Accounting Technology | Under | Over | Over | Meets | Under |
| | Administrative Assistant | Under | Under | Under | Under | Under |
| | Finance | Under | Under | | Under | |
| | Marketing | Over | | | Meets | Under |

Over Oversupplied  Meets Meets Demand  Under Undersupplied

*Source: MTDLI 2015-2025 occupational employment projections by region and graduate data from OCHE, CC and RMC. Demand is sum of regional demand for all occupations a graduate from the program could fill. Supply is average over last three academic years from colleges within the region.*

While Montana colleges have the capacity to meet statewide demand for most programs, there are geographic mismatches in supply and demand that make it difficult for employers to find graduates from oversupplied programs. For example, Montana colleges have recently developed the capacity to meet projected demand for registered nurses, but the regional analysis shows than both the North-west and South Central regions are undersupplied. All other regions oversupply registered nurse

graduates. Registered nurse graduates from colleges in the oversupplied regions will most likely need to fill job openings in the Northwest and South Central regions for employers in those regions to have access to the workers they need.

The general studies program is the only program that is consistently oversupplied in every region of the state. Colleges across the Montana may need to consider whether existing capacity for the general studies program is appropriate given employer demand levels.

All of the computer and information science programs, and the social work program are undersupplied at the statewide level, and are identified as program expansion candidates at four-year colleges. The regional analysis demonstrates where the discrepancies between supply and demand for these programs are occurring. Computer science graduates are undersupplied in every region where the program exists. The information technology program is not supplying enough graduates to meet demand in the South Central region. The social work program exists only in the western regions of the state, and is undersupplied in the Southwest. Four-year colleges in undersupplied regions would be good candidates to expand their programs. However, college location is only one consideration when deciding where to expand program capacity. The university system must also consider cost-effectiveness while still meeting the needs of employers.

The automotive technology, mechanic repair technology, and HIT and medical coding programs were identified as expansion candidates at two-year colleges. Automotive technology is undersupplied in every region of the state. The mechanic repair technology program is undersupplied in the Southwest and South Central regions. Expansion of the mechanic repair technology program should address potential workforce shortages in that region, as well as shortages in the Eastern and North Central regions where there are no mechanic repair technology programs to meet employer needs. The HIT and medical coding program is undersupplied in every region except the North Central. Increased capacity in the HIT and medical coding program could occur at two-year colleges in any undersupplied region.

## 4.3 Occupational Supply and Demand by Region

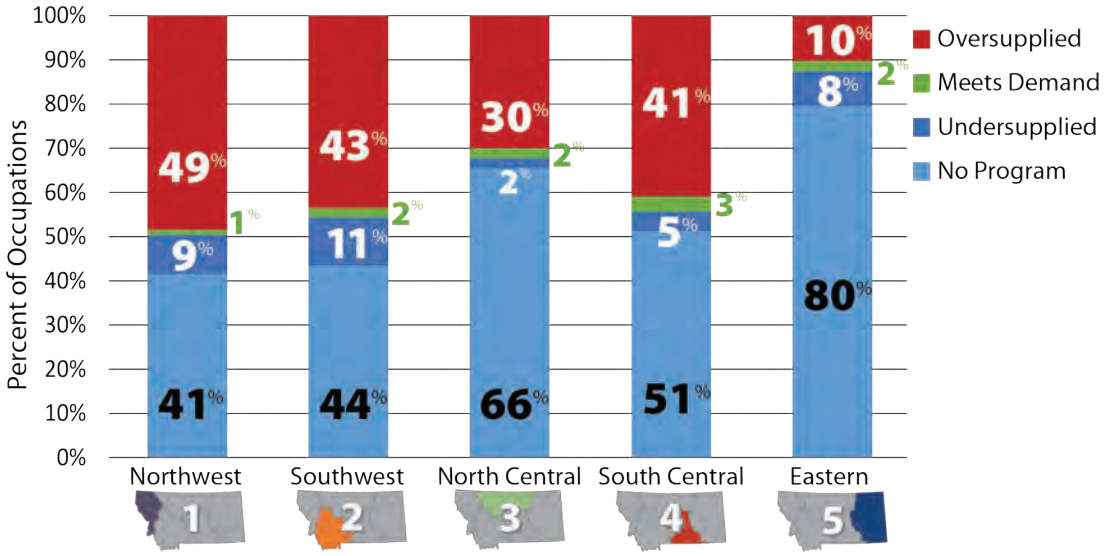
The occupational supply and demand analysis by region compares the supply of graduates from colleges in each region to the estimated worker demand in the region. The analysis focuses on high-demand occupations, defined as the occupations in the top 25th percentile for total openings. The occupations that qualify as high-demand differ by region. Supply is calculated as the number of graduates from colleges in each region who are trained to work in the occupation.

While 63% of high-demand occupations are oversupplied at the statewide level, the regional analysis by occupation shows significant unmet demand in the state's more rural regions. Colleges in the Eastern and Central regions cannot meet employer demand for most high-demand occupations in their regions. The Eastern region does not have any programs to train students for 80% of the high-demand occupations in the region. Another 8% of occupations are undersupplied by colleges in the East. In the North Central region, 66% of high-demand occupations cannot be filled by graduates from local colleges. **Figure 4.5** shows the percentage of high-demand occupations that fall into each supply and demand category by region.

Occupational analysis shows **significant unmet demand** in the **North Central** and **Eastern** regions.

FIGURE 4.5

## OCCUPATIONAL SUPPLY AND DEMAND ANALYSIS BY REGION




*Source: MTDLI 2015-2025 occupational employment projections and graduate data from OCHE, CC and RMC.*

Despite significant unmet demand in the North Central and Eastern regions, colleges in these regions may not want to develop new programs or expand existing programs because the unmet regional employer demand is not large enough to justify the cost. Only six of the high-demand occupations not served by colleges in the North Central region have more than ten projected annual openings, and only three have more than ten openings in the Eastern region. In the East, these occupations are accountants, nursing assistants, and heavy tractor-trailer truck drivers.[23] In the North Central region, the list expands to include substitute teachers, teaching assistants, and computer user support specialists. If colleges in the North Central and Eastern regions choose not to meet demand for these occupations, employers will rely on graduates from outside the regions to help fill demand.

**The mobility of the graduate workforce is critical to ensuring employers in all regions of the state have access to the workforce they need.**

While most of the unmet demand is in the rural regions of Montana, none of the colleges can fill all of the workforce demand in their region. Colleges in the Northwest have the most capacity, meeting demand for 50% of high-demand occupations in the region. However, it should not be expected that colleges in each region would produce the exact number of graduates needed by local businesses every year. College can more efficiently serve the state economy by developing specializations. As long as employers are able to attract graduates from other regions to help fill demand, colleges should not be expected to meet demand for every occupation in their region. The mobility of the graduate workforce is critical to ensuring employers in all regions of the state have access to the workforce they need, particularly for employers located in more rural sections of Montana.

23 *This study does not fully capture the supply of nursing assistants, and heavy tractor-trailer truck drivers, so it is possible there are programs in the East that can meet regional demand.*

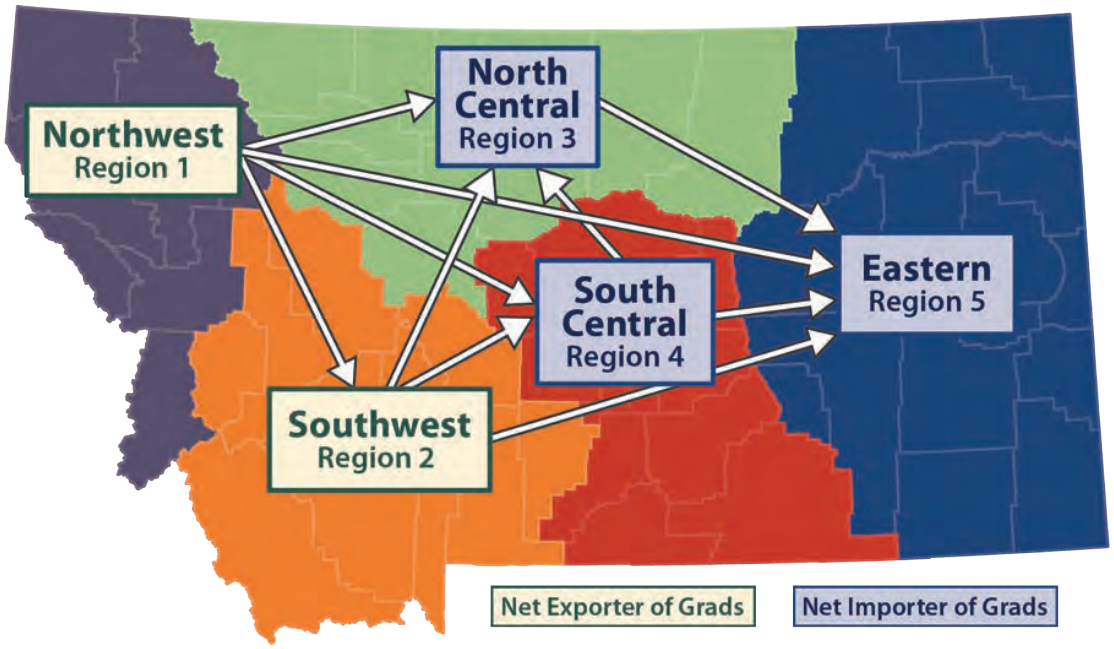
## 4.4 Graduate Migration Helps Fill Regional Gaps in Supply and Demand

Graduate migration helps alleviate some of the regional discrepancies in worker supply and demand. The rural regions of the state have more significant unmet demand than the populated regions. Employers in the Eastern and Central regions rely on graduates from the west to help fill demand. As a result, students migrate after graduation from the more populated western regions into the areas where there is unmet demand. **Figure 4.6** illustrates the migration patterns of graduates a year after graduation. The Northwest and Southwest regions are net exporters of graduates, and the North Central, South Central, and Eastern regions are net importers.

FIGURE 4.6

### REGIONAL MIGRATION OF GRADUATES A YEAR AFTER GRADUATION

from 2010-2015




*Source: MTDLI, OCHE, RMC, and CC graduate data wage match. Excludes year prior to 2010 due to lack of Region 5 data. Arrows show net migration between regions.*

Despite the large number of workers demanded by employers in the west, the Southwest and Northwest tend to produce more graduates than demanded by the region. Both the Southwest and Northwest regions are net exporters of graduates, meaning more graduates leave the region after graduation than come from other regions to work. The other three regions of Montana are net importers of graduates. These regions do not produce as many graduates, and graduates from the west migrate into these regions after graduation to help fill demand.

Of the net importing regions, the Eastern region appears to have the most unmet demand because employers in that region import graduates from every other region. The North Central region exports graduates to the Eastern region, but imports from the other three regions. The South Central region has the largest population base of all the net importing regions, and seems to have the least unmet demand because the region exports graduates to both the North Central and Eastern regions.

Migration patterns provide insight into areas with unmet demand, as graduates are drawn to areas where employment opportunities are most attractive. In areas with substantial unmet demand, natural market forces should attract students into the region as limited worker supply puts upward pressure on wages. Graduates appear to be responding to these forces and moving to the areas with the greatest need. Colleges often focus on serving their local labor force, and they are an important source of labor for local employers. However, graduate migration is also an important part of a healthy state economy.

## SECTION 4 HIGHLIGHTS

- Montana colleges are an important source of labor in their local communities. Employers hire most of their graduates from colleges located in their region (**Figure 4.2**).
- The rural areas of the state have more significant unmet demand than the populated regions. Eighty percent of high-demand occupations in the Eastern region cannot be filled with existing programs at the colleges in that region (**Figure 4.5**).
- No region has the capacity to fill expected demand with graduates from the region (**Figure 4.5**). If employers are able to attract graduates from other regions to help fill demand, then colleges should not be expected to meet demand for every occupation in their region.
- Computer science and automotive technology programs are undersupplied in every region of the state (**Figure 4.4**).
- While Registered and Practical nursing are oversupplied at the state level, there are regions where the programs are undersupplied (**Figure 4.4**).
- General studies is the only program that is oversupplied in every region (**Figure 4.4**).
- Graduate mobility helps to alleviate regional disparities in worker supply and demand. Graduates move from the populated western regions into the more rural areas to help fill unmet demand (**Figure 4.6**).
- The Eastern region appears to have the largest unmet demand, as the region imports graduates from every region in Montana (**Figure 4.6**).

SECTION 5:

# CONCLUSION

Montana college graduates are an important part of the state's labor market. Over the last fifteen years, the post-secondary system has produced about 100,000 graduates in 230 different programs. Most of these graduates obtained a bachelor's degree from one of the state's four-year colleges located in the west. After graduation, most students work in the state in their field of study, thus contributing to the Montana economy. On average, 69% of graduates were working in Montana making above the state entry-level wage one year after graduation. Graduates who worked year-round earned above the median wage after one year. Graduates work in every county in Montana, illustrating the importance of post-secondary education in workforce development efforts throughout the state.

Retention in the Montana workforce is greater for graduates who earned an associate degree or certificate, and graduates with prior work experience, likely because shorter training times for associate degrees and stronger connections between two-year colleges and local labor markets result in greater retention of graduates. However, two-year colleges' stronger connections to the Montana labor market also leads to enrollment and graduation rates that are more susceptible to changing economic conditions.

Graduates with higher education have higher income levels on average. The largest difference in income between degree types occurs between bachelor's and graduate degrees. There are minimal differences in earnings between bachelor's and associate degree holders in Montana, but the returns to education vary by program. Information technology graduates have high wage premiums from bachelor's degree attainment, but registered nursing graduates see minimal differences in wages.

The post-secondary system is able to meet the majority of employer demand with their existing capacity. However, there are a few potential areas for new program development and program expansion. New programs could be developed to train high-level healthcare professionals, like dentists and occupational therapists. However, the development of new programs require significant resources and investment by both the education system and employers, and these costs must be weighed against the benefits of development. Candidates for program expansion at the four-year colleges include the computer and information science programs, as well as social work. At two-year colleges, expansion candidates include automotive service technicians, mechanic repair technology, and health information technology and medical coding. The workforce outcomes show students from these programs are able to find employment quickly in Montana, supporting the conclusion that the programs are undersupplied and may be good candidates for expansion.

A number of programs were identified as oversupplied at the statewide level. The oversupplied programs in liberal arts, business, social science and physical science also have below-average workforce outcomes, confirming the analysis. The most significantly oversupplied program in Montana is general studies. Despite minimal demand, colleges in Montana have produced an average of 865 general studies graduates over the last three academic years, making general studies the largest program among graduates. While the general studies program is designed as a transfer program and may meet demand from students who are unsure of their career interests, only 40% of students who graduate with an associate in general studies achieve a bachelor's degree or higher. Furthermore, only the general studies program is consistently oversupplying graduates in every region of the state. Colleges across Montana may need to consider whether existing capacity for the general studies program is appropriate given employer demand levels.

If employers are having difficulty hiring students from oversupplied programs, the issue is probably one of distribution and retention in Montana – not capacity in the university system. For example, significant effort has been made in recent years to increase the capacity of the registered nurse program and streamline the transition between associate and bachelor's nursing programs. As a result, Montana colleges are now estimated to have the capacity to meet statewide demand. However, employers may still have difficulty hiring registered nurses if they are located in an undersupplied region, and cannot attract nurses from other regions. Employers looking for bachelor's degree registered nurses may also have difficulty hiring because only 56% of registered nurse graduates achieve this degree. Even with sufficient capacity at the university system, employers will have difficulty hiring graduates if graduates are not located where they are most needed.

The regional supply and demand analysis shows more significant unmet demand in the rural central and eastern regions. The majority of high-demand occupations in these regions cannot be filled by graduates from colleges within the region. Most graduates come from the western regions and migrate into the rural areas with more unmet demand, helping to alleviate discrepancies between supply and demand in those regions. Labor force mobility is a critical element of ensuring all employers have access to a well-trained workforce. None of the colleges can fill all of the workforce demand in their region. Graduate mobility allows for program specialization among colleges, and improves the efficiency of post-secondary education in Montana.

As Montana faces a worker shortage, the post-secondary education system provides an important source of workforce supply. The information provided in this report indicates that Montana colleges are successful in meeting both student and employer needs, but improvements could always be made. With insights provided in this report, the education and training systems in the state are better prepared to plan for the future and design strategies for continual improvement.

# APPENDIX A:

# METHODOLOGY

## A.1 Workforce Outcomes Methodology

In order to understand workforce outcomes for graduates of Montana's educational institutions, graduate data was matched to wage records collected through the mandatory reporting of payroll wages by employers to the Montana Department of Labor & Industry (MTDLI) for UI program purposes. This research was governed by the security requirements outlined in the Memorandum of Understanding (MOU) between the MTDLI and the Office of the Commissioner of Higher Education (OCHE) designed to protect the confidentiality of the UI wage files and protect the privacy of graduates.

Additionally, the individual graduate data was also matched to Montana's income tax records maintained by the Montana Department of Revenue (DOR) to capture additional sources of income besides wages. This match was governed by the security requirements outlined in the MOU between MTDLI and DOR to protect the confidentiality of income tax data and graduate information. Using both income tax data and wage records allowed for a more comprehensive understanding of the workforce outcomes of graduates. The data and methodology for the matches is outlined in the sections below.

## A.1.1 Description of the Graduate Data

The data in this study considers graduates from all 16 schools in the Montana University System (MUS) data warehouse, plus graduates from Carroll College and Rocky Mountain College. The study includes 99,365 graduates over 14 academic years, from 2001-02 to 2014-15. An academic year is defined by the academic calendar, from summer of a given year through spring of the following year. On average, there were 7,098 graduates and 8,053 degrees awarded per year. **Figure A.1** highlights summary information on the graduate data.

FIGURE A.1

### SUMMARY STATS FOR GRADUATE DATA

| | |
|---|---|
| Number of Graduates | 99,365 |
| Average Graduates Per Year | 7,098 |
| Number of Degrees | 112,743 |
| Average Degrees Per Year | 8,053 |
| Number of Colleges | 18 |
| Number of Academic Years | 14 |
| Timeframe Provided | 2001-02 to 2014-15 |
| Percent Single Degree Holders | 88% |

*Source: Office of the Commissioner of Higher Education, Montana University System warehouse, Rocky Mountain College and Carroll College graduate data.*

**Figure A.2** shows the number of graduates by college. Montana's two flagship universities have the most graduates, with approximately 30,000 at each school over the last fourteen years. There are a total of eight four-year universities and nine two-year colleges that make up the 18 schools included in these data. Most of these colleges are located in Montana's major cities: Billings, Missoula, Great Falls, Bozeman, Helena, Butte, and Kalispell. However, Dawson Community College, MSU-Northern, and UM-Western are located in more rural areas of the state.

The study excludes educational institutions in the state that do not have a current data sharing MOU with MTDLI. Tribal colleges are not included, nor is the University of Great Falls. Efforts were made to reach out to institutions to include them in the report. Future research will continue to add interested institutions. While the graduate data does not include every college or training institution in the state, the data does provide a good representation of the state's workforce training capacity.

## FIGURE A.2
## GRADUATES BY COLLEGE

| College | Total Number of Graduates | 3-Yr Annual Avg Number of Grads | First Academic Year of Grads | Type of College | Location |
|---|---|---|---|---|---|
| Carroll College | 3,608 | 270 | 2001-02 | 4-Year | Helena |
| City College | 2,735 | 273 | 2001-02 | 2-Year | Billings |
| Dawson CC | 328 | 60 | 2010-11 | 2-Year | Glendive |
| Flathead Valley CC | 4,020 | 381 | 2001-02 | 2-Year | Kalispell |
| Gallatin College | 140 | 70 | 2013-14 | 2-Year | Bozeman |
| Great Falls College | 2,972 | 358 | 2001-02 | 2-Year | Great Falls |
| Helena College | 2,385 | 213 | 2001-02 | 2-Year | Helena |
| Highlands College | 1,129 | 112 | 2001-02 | 2-Year | Butte |
| MSU-Billings | 8,317 | 667 | 2001-02 | 4-Year | Billings |
| MSU-Bozeman | 29,515 | 2,647 | 2001-02 | 4-Year | Bozeman |
| MSU-Northern | 3,638 | 270 | 2001-02 | 4-Year | Havre |
| MT-Tech | 4,275 | 385 | 2001-02 | 4-Year | Butte |
| Miles CC | 511 | 107 | 2010-11 | 2-Year | Miles City |
| Missoula College | 4,088 | 423 | 2001-02 | 2-Year | Missoula |
| Rocky Mountain | 2,672 | 233 | 2001-02 | 4-Year | Billings |
| UM-Missoula | 30,557 | 2,482 | 2001-02 | 4-Year | Missoula |
| UM-Western | 2,712 | 274 | 2001-02 | 4-Year | Dillon |

*Source: OCHE, RMC, and CC graduate data.*
*Notes: Missoula College graduates include Bitterroot College. Total number of graduates at each college do not add up to total number of graduates because one graduate can earn degrees from multiple schools.*

## A.1.2 Program Categorization

There were over 2,100 different programs recorded since 2001 by the 18 colleges in the study. Most of the difference between programs occurred because of coding and naming inconsistences between colleges and changes overtime. The 2,100 programs were grouped together to generate a manageable list of 230 unique programs. Each of the two thousand programs were categorized individually based on the following factors:

- Classification of Instructional Program (CIP) Code recorded by the college.
- Feedback from program heads at the colleges on the history of the program and the types of jobs people graduating from the program have filled
- CIP to Standard Occupational Classification (SOC) code crosswalk published by the U.S. Department of Education and U.S. Department of Labor, which identifies the occupations an individual is qualified to fill after graduating from a program.

The 230 programs are a result of combining like programs across colleges, and programs within a college that have changed overtime. Significant effort was made to update old CIP codes and ensure the CIP codes accurately represented the programs at each college. Programs with the same CIP code at two different colleges were combined, as were programs that led to the same occupations based on the CIP to SOC crosswalk provided by the U.S. Department of Education and U.S. Department of Labor. This study treats programs as the same across colleges, even though colleges may teach programs differently. **Figure A.3** shows which colleges are producing graduates in the resulting 230 programs.

### FIGURE A.3
### PROGRAMS PRODUCING GRADUATES AT EACH COLLEGE

| Program Description | CIP | Carroll | City C | Dawson | FVCC | Gallatin | Great Falls C | Helena C | Highlands | Miles CC | Missoula C | MSU-Billings | MSU-Bozeman | MSU-Northern | MT-Tech | Rocky Mtn | UM-Missoula | UM-Western |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agricultural Business and Management[1] | 010101 | | | A | | | | | | X | | | A | A | | | | |
| Agricultural Mechanics Technology | 010205 | | | X | | | | X | | | | | | A | | | | |
| Agricultural Production[2] | 010301 | | | | | | | | | A | | | | | | | | |
| Sustainable Food and Bioenergy | 010308 | | | | | | | | | | | | A | | | | | |
| Agricultural and Food Product Processing | 010401 | | | | | | | | | X | | | | | | | | |
| Equestrian Studies | 010507 | | | | | | | | | A | | | | | | A | | A |
| Animal Science | 010901 | | | | | | | | | X | | | A | | | | | |
| Plant Science | 011101 | | | | | | | | | | | | A | | | | | |
| Range Science and Management | 011106 | | | | | | | | | | | | A | | | | | |
| Natural Resource Conservation and Management | 030101 | | | | A | | | | | | | | A | | | | A | |
| Environmental Science[3] | 030103 | A | | | | | | | | | | A | A | | | A | A | A |
| Land Use Planning and Management | 030206 | | | | | | | | | | | | A | | | | | |
| Natural Resources Management and Policy, Other | 030299 | | | | | | | | | | | | | | | | A | |
| Forestry[4] | 030501 | | | | | | | | | | | | | | | A | A | |
| Fish and Wildlife Management | 030601 | | | | | | | | | | | | A | | | | A | |
| Architecture | 040201 | | | | | | | | | | | | A | | | | | |

*A = Active. More than one graduate average over the last three academic years.*
*X = Program existed, but is not currently active. One or fewer average graduates per year over the last three academic years.*

## FIGURE A.3 (CONTINUED)

## PROGRAMS PRODUCING GRADUATES AT EACH COLLEGE

| Program Description | CIP | Carroll | City C | Dawson | FVCC | Gallatin | Great Falls C | Helena C | Highlands | Miles CC | Missoula C | MSU-Billings | MSU-Bozeman | MSU-Northern | MT-Tech | Rocky Mtn | UM-Missoula | UM-Western |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Environmental Design/Architecture | 040401 | | | | | | | | | | | | A | | | | | |
| Ethnic, Cultural Minority, Gender, & Group Studies | 050299 | | | | | | | | | | | | A | | | | A | |
| Communication Studies | 090101 | A | | | | | | | | | | | X | X | | A | A | |
| Mass Communication | 090102 | A | | | | | | | | | | A | | | | | | |
| Journalism | 090401 | | | | | | | | | | | | | | | | A | |
| Radio and Television | 090701 | | | | | | | | | | | | | | | | A | |
| Public Relations | 090902 | | | | | | | | | | | A | | | | | | |
| Information Technology | 110103 | | | | A | | A | | | | A | | | | | X | | |
| Computer Programming/Application Development | 110201 | | A | | | | | A | | | | | | | | | | |
| Data Processing Technology | 110301 | | | | | | X | | | | | | | | | | | |
| Information Science | 110401 | | | | | | | | | | | | | | | | A | |
| Computer Information Systems | 110501 | A | | | | | | | | | | | | X | | | | |
| Computer Science | 110701 | A | | | | | | | | | | | A | | A | A | A | |
| Web Technology | 110801 | | | | A | | A | | | A | | | | | | | | |
| Network Technology | 110901 | | A | | X | | A | | A | | | | | | A | | | |
| Network and System Administration | 111001 | | | | | | A | | | | | | | | | | | |
| Computer and Information Systems Security | 111003 | | | | | | | | | A | | | | | | | | |
| Web Development | 111004 | | | | | | | | X | | | | | | X | | | |
| Computer Support Specialist | 111006 | | | | | | | | | | A | | | | | | | |
| Barber-Styling | 120402 | | | | | | | | | | X | | | | | | | |
| Culinary Arts | 120503 | | | | A | | | | | | A | | | | | | | |
| Food Service Management | 120504 | | | | | | | | | | A | | | | | | | |
| Education, General | 130101 | | | | | | | | | | | A | A | | | | A | |
| Curriculum and Instruction | 130301 | | | | | | | | | | | A | A | | | | A | |
| Education Administration | 130401 | | | | | | | | | | | | A | | | A | A | |
| Higher Education Administration | 130406 | | | | | | | | | | | | A | | | | | |
| Learning Development | 130607 | | | | | | | | | | | | | A | | | | |
| Special Education | 131001 | | | | | | | | | X | | A | | | | | X | |
| School Counselor | 131101 | | | | | | | | | | | A | | A | | | A | |
| Elementary Education | 131202 | A | | | | | X | | | X | | A | A | A | | A | X | A |
| Secondary Education | 131205 | | | | | | X | | | | | | X | X | | | X | X |
| Teacher Education | 131206 | | | | | | X | | | | | | | | | | | |
| Early Childhood Education | 131210 | | | A | A | | | | | | | X | | | | | | A |
| Agricultural Teacher | 131301 | | | | | | | | | | | | A | | | | | |
| Art Teacher | 131302 | | | | | | | | | | | A | | | | A | | A |
| Business Teacher | 131303 | | | | | | | | | | | | | X | | | | A |
| English Teacher | 131305 | A | | | | | | | | | | A | | A | | X | | A |
| Technology Teacher | 131309 | | | | | | | | | | | | A | | | | | X |
| Mathematics Teacher | 131311 | A | | | | | | | | | | A | | | | X | | A |
| Music Teacher | 131312 | | | | | | | | | | | A | A | | | X | | A |
| Health and Physical Education Teacher | 131314 | A | | | | | | | | X | | A | A | A | | X | | A |
| Reading Teacher | 131315 | | | | | | | | | | | A | | | | | | |

*A = Active. More than one graduate average over the last three academic years.*
*X = Program existed, but is not currently active. One or fewer average graduates per year over the last three academic years.*

## FIGURE A.3 (CONTINUED)

## PROGRAMS PRODUCING GRADUATES AT EACH COLLEGE

| Program Description | CIP | Carroll | City C | Dawson | FVCC | Gallatin | Great Falls C | Helena C | Highlands | Miles CC | Missoula C | MSU-Billings | MSU-Bozeman | MSU-Northern | MT-Tech | Rocky Mtn | UM-Missoula | UM-Western |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Science Teacher | 131316 | | | | | | | | | | | X | A | A | | X | | A |
| Social Science Teacher | 131317 | A | | | | | | | | | | X | A | A | | | | A |
| Social Studies Teacher | 131318 | A | | | | | | | | | | | | | | A | | |
| Industrial Teacher | 131320 | | | | | | | | | | | | | A | | | | |
| Computer Teacher | 131321 | | | | | | | | | | | A | | | | | | |
| Biology Teacher | 131322 | X | | | | | | | | | | X | | | | X | | X |
| Chemistry Teacher | 131323 | X | | | | | | | | | | X | | | | | | |
| History Teacher | 131328 | X | | | | | | | | | | A | | | | X | | A |
| Spanish Teacher K-12 | 131330 | X | | | | | | | | | | X | | | | | | |
| School Librarian | 131334 | | | | | | | | | | | | A | | | | | |
| Earth Science Teacher | 131337 | | | | | | | | | | | | | | | | | X |
| Teaching English to Speakers of Other Languages | 131401 | X | | | | | | | | | | | | | | | | |
| Teachers Assistant | 131501 | | | | | | | | | X | | | | | | | | A |
| General Engineering | 140101 | A | | X | | | | | | | | | A | | A | | | |
| Chemical Engineering | 140701 | | | | | | | | | | | | A | | | | | |
| Civil Engineering | 140801 | A | | | | | | | | | | | A | | | | | |
| Computer Engineering | 140901 | | | | | | | | | | | | A | | | | | |
| Software Engineering | 140903 | | | | | | | | | | | | | | A | | | |
| Electrical and Electronics Engineering | 141001 | | | | | | | | | | | | A | | A | | | |
| Environmental Engineering | 141401 | | | | | | | | | | | | A | | A | | | |
| Mechanical Engineering | 141901 | | | | | | | | | | | | A | | | | | |
| Metallurgical Engineering | 142001 | | | | | | | | | | | | | | A | | | |
| Petroleum Engineering | 142501 | | | | | | | | | | | | | | A | | | |
| Industrial Engineering | 143501 | | | | | | | | | | | | A | | | | | |
| Geological/Geophysical/Mining Engineering[5] | 143901 | | | | | | | | | | | | | | A | | | |
| Civil Engineering Technology | 150201 | | | | | | | | A | | | | | A | X | | | |
| Electronics Technology | 150303 | | | | | | | | | | A | | X | A | | | | |
| Process Plant Technology | 150499 | | A | | | | | | | | | | | | | | | |
| Energy Technology | 150503 | | A | | | | A | | A | | A | | | A | | | | |
| Water Quality and Treatment Management | 150506 | | | | | | | X | | | | | | X | | | | |
| Metals Technology | 150611 | | | | | | | | | | | | | X | | | | |
| Industrial Technology | 150612 | | | | | | X | | | | | | | A | | | | |
| Nondestructive Testing | 150799 | | | | A | | | | | | | | | | | | | |
| Mechanical Engineering Technology | 150805 | | | | | | | | | | | | A | | | | | |
| Petroleum Technology/Technician | 150903 | | | | | | | X | | | | | | | | | | |
| Construction Engineering Technology | 151001 | | | | | | | A | | | | | A | X | | | | |
| Surveying | 151102 | | | | A | | | | | | | | | | | | | |
| Computer System Technology | 151202 | | A | | | | | | | | | | | | | | | |
| Drafting and Design Technology[6] | 151301 | | A | | | A | X | | A | | A | | A | A | X | | | |
| Engineering Management | 151501 | | | | | | | | | | | | X | | | | | |
| Foreign Languages and Literatures[7] | 160101 | A | | | | | | | | | | A | A | | | | A | |
| Linguistics[8] | 160102 | X | | | | | | | | | | | | | | | A | |

*A = Active. More than one graduate average over the last three academic years.*
*X = Program existed, but is not currently active. One or fewer average graduates per year over the last three academic years.*

## FIGURE A.3 (CONTINUED)

## PROGRAMS PRODUCING GRADUATES AT EACH COLLEGE

| Program Description | CIP | Carroll | City C | Dawson | FVCC | Gallatin | Great Falls C | Helena C | Highlands | Miles CC | Missoula C | MSU-Billings | MSU-Bozeman | MSU-Northern | MT-Tech | Rocky Mtn | UM-Missoula | UM-Western |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Family and Consumer Science | 190101 | | | | | | | | | | | | A | | | | A | |
| Food and Nutrition | 190501 | | | | | | | | | | | | A | | | | | |
| Law[9] | 220101 | | | | | | | | | | | | | | | | A | |
| Legal Support Specialists | 220301 | | | | X | | | A | | | X | | | | | | | |
| Paralegal Studies | 220302 | | | | | | X | | | | A | | | | | | | |
| English | 230101 | X | | | | | | | | | | A | A | | | A | A | A |
| English Writing[10] | 231301 | A | | | | | | | | | | | | | A | | | |
| Creative Writing[11] | 231302 | A | | | | | | | | | | | | | | A | A | |
| General Studies[12] | 240102 | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A |
| Biology | 260101 | A | | | | | | | | | | A | A | A | A | A | A | A |
| Biochemistry | 260202 | A | | | | | | | | | | | A | | | X | A | |
| Molecular Biology | 260204 | | | | | | | | | | | | A | | | | | |
| Cell Biology | 260401 | | | | | | | | | | | | A | | | | | |
| Microbiology | 260502 | | | | | | | | | | | A | A | | | | A | |
| Entomology | 260702 | | | | | | | | | | | | A | | | | | |
| Toxicology | 261004 | | | | | | | | | | | | | | | | A | |
| Biotechnology | 261201 | | | | | | | | | | | | A | | | | | |
| Ecology | 261301 | | | | | | | | | | | | | | | | A | |
| Environmental Biology | 261305 | | | | | | | | | | | A | | | | | | |
| Neuroscience | 261501 | | | | | | | | | | | | | | | | A | |
| Mathematics | 270101 | A | | | | | | | | | | A | A | X | A | A | A | X |
| Engineering Mathematics | 270301 | A | | | | | | | | | | | | | | | | |
| Statistics | 270501 | | | | | | | | | | | | A | | A | | | |
| Gerontology | 301101 | | | | X | | | | | | | | | | | | | |
| Historic Preservation | 301201 | | | | | | | | X | | | | | | | | X | |
| Parks, Recreation and Leisure Studies | 310101 | | | | | | | | | | | A | | | | | | |
| Recreation Management | 310399 | | | | | | | | | | | | | | | | A | |
| Health and Physical Education/Fitness, General | 310501 | A | | | A | | | | | | | A | X | A | | A | A | A |
| Kinesiology and Exercise Science | 310505 | | | | | | | | | | | | A | | | A | | |
| Philosophy | 380101 | A | | | | | | | | | | | A | | | X | A | |
| Ethics & Value Studies | 380103 | X | | | | | | | | | | | | | | | | |
| Theology | 390601 | A | | | | | | | | | | | | | | | | |
| Physical Science | 400101 | | | | | | | | | | | | | | X | | | |
| Chemistry | 400501 | A | | | | | | | | | | A | A | | A | X | A | |
| Geology | 400601 | | | | | | | | | | | | A | | A | A | A | |
| Physics | 400801 | X | | | | | | | | | | | A | | | | A | |
| Bioscience Technology | 410101 | | | | | | X | | | | | | | | | | | |
| Psychology | 420101 | A | | | | | | | | | | A | A | | | A | A | A |
| School Psychology | 422805 | | | | | | | | | | | | | | | | A | |
| Corrections | 430102 | | | | | | | X | | | | | | | | | | |
| Criminal Justice | 430104 | | X | A | A | | | | | | | A | | A | | | | |
| Law Enforcement | 430107 | | | A | | | | | | | | | | | | | | |

*A = Active. More than one graduate average over the last three academic years.*
*X = Program existed, but is not currently active. One or fewer average graduates per year over the last three academic years.*

## FIGURE A.3 (CONTINUED)

## PROGRAMS PRODUCING GRADUATES AT EACH COLLEGE

| Program Description | CIP | Carroll | City C | Dawson | FVCC | Gallatin | Great Falls C | Helena C | Highlands | Miles CC | Missoula C | MSU-Billings | MSU-Bozeman | MSU-Northern | MT-Tech | Rocky Mtn | UM-Missoula | UM-Western |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fire and Rescue[13] | 430203 | | A | | | | X | A | | | | | | | | | | |
| Emergency Management | 430302 | | | | X | | | | | | | | | | | | | |
| Human Services | 440000 | | | | A | | | | | | X | A | | | | | | |
| Community Leadership | 440201 | | | | | | | | | | | | | A | | | | |
| Public Administration | 440401 | X | | | | | | | | | | A | A | | | | A | |
| Social Work | 440701 | X | | | | | | | | | | | | | | | A | |
| Social Science, General | 450101 | | | | | | | | | | | | | | | | | A |
| Anthropology | 450201 | | | | | | | | | | | | A | | | | A | |
| Economics | 450601 | | | | | | | | | | | | A | | | X | A | |
| Geography | 450701 | | | | | | | | | | | | | | | | A | |
| Geographic Information Systems | 450702 | | | | | | | | X | | | | | | X | | A | |
| Political Science[14] | 451001 | A | | | | | | | | | | A | A | | | | A | A |
| Sociology | 451101 | A | | | | | | | | | | A | A | | | A | A | |
| Sociology and Anthropology | 451301 | | | | | | | | | | | | | | | | | A |
| Carpentry | 460201 | | A | | A | X | A | X | A | A | A | | | | X | | | |
| Electrical Technology | 460302 | | | | A | | | | | | | | | | | | | |
| Lineworker | 460303 | | | | | | | | A | | | | | | | | | |
| Building Maintenance | 460401 | | | | | | | | | | A | | | | | | | |
| Plumbing Technology | 460503 | | | | | | | | | | | | | A | | | | |
| Electronics Technician | 470105 | | | | A | | | X | | | | | | | | | | |
| Heating, Ventilation & Refrigeration Maintenance | 470201 | | X | | A | | | | | | | | | | | | | |
| Auto Collision Repair & Refinishing | 470603 | | A | | A | | X | | | | | | | X | | | | |
| Automotive Technology | 470604 | | A | | | | | A | A | A | | | | A | X | | | |
| Diesel Technology | 470605 | | A | X | | | | A | | | A | | | A | | | | |
| Recreational Power Equipment | 470606 | | | | | | | | | | A | | | | | | | |
| Aviation Maintenance Tech | 470607 | | | | | | | A | | | | | | | | | | |
| Machining Technology | 480501 | | | | | | | | A | | | | | | | | | |
| Welding Technology | 480508 | | A | A | A | A | A | A | A | | A | | A | A | | | | |
| CNC Machinist Technology | 480510 | | | | A | A | | A | | | | | | | | | | |
| Metal Fabricator | 480511 | | | | | | | A | A | | | | | | | | | |
| Aviation | 490102 | | | | | A | X | | | | | | A | | | A | | |
| Aviation Management | 490104 | | | | | | | | | | | | | | | A | | |
| Heavy Equipment Operation | 490202 | | | | A | | | | | A | A | | | | | | | |
| Visual and Performing Arts | 500101 | | | | | | | | | | | A | A | | | A | A | A |
| Dance | 500301 | | | | | | | | | | | | | | | | A | |
| Interior Design | 500408 | | | | | A | A | A | | | | | A | | | | | |
| Graphic Design | 500409 | | | | A | | A | | | | | | | A | | | | |
| Theatre | 500501 | A | | | | | | | | | | A | | | | A | A | |
| Technical Theatre | 500502 | | | | | | | | | | | | | | | A | | |
| Cinematography and Film | 500602 | | | | | | | | | | | | A | | | | A | |
| Goldsmithing & Jewelry Design | 500713 | | | | A | | | | | | | | | | | | | |

*A = Active. More than one graduate average over the last three academic years.*
*X = Program existed, but is not currently active. One or fewer average graduates per year over the last three academic years.*

## FIGURE A.3 (CONTINUED)

## PROGRAMS PRODUCING GRADUATES AT EACH COLLEGE

| Program Description | CIP | Carroll | City C | Dawson | FVCC | Gallatin | Great Falls C | Helena C | Highlands | Miles CC | Missoula C | MSU-Billings | MSU-Bozeman | MSU-Northern | MT-Tech | Rocky Mtn | UM-Missoula | UM-Western |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Music | 500903 | | | A | | | | | | | | A | A | | | A | A | |
| Speech Language Pathology | 510204 | | | | | | | | | | | | | | | | A | |
| Dental Assistant | 510601 | | | | | | A | | | | | | | | | | | |
| Dental Hygiene | 510602 | | | | | | A | | | | | | | | | | | |
| Health Care Office Management[15] | 510701 | | | | A | | A | | | | A | A | | | | | | |
| Health Information Technology[16] | 510707 | | | | X | | A | | A | | A | | X | | A | | | |
| Medical Transcription | 510708 | | | | A | | A | | | X | | | | | | | | |
| Medical Coding | 510713 | | A | | A | A | A | | | X | | | | | | | | |
| Medical Admin Assistant[17] | 510716 | | A | | A | A | A | A | A | X | A | | X | | X | | | |
| Pharmacy Technician | 510805 | | | | A | | A | | | X | A | | | | | | | |
| Physical Therapy Assistant | 510806 | | | | A | | A | | | | | | | | | | | |
| Paramedic | 510904 | | A | | A | | A | | | | | | | | | | | |
| Respiratory Care | 510908 | | | | | | A | | | | A | | | | | | | |
| Surgical Technology | 510909 | | | | A | | A | | | | A | | | | | | | |
| Radiologic Technology | 510911 | | A | | A | | A | | A | | A | | | | X | | | |
| Physician Assistant | 510912 | | | | | | | | | | | | | | | A | | |
| Athletic Training | 510913 | | | | | | | | | | | A | | | | A | A | |
| Medical Laboratory Technology | 511004 | | | | | | | | | | X | | | | | | | |
| Medical Technology | 511005 | | | | | | | | | | | | | | | | A | |
| Phlebotomy Technician | 511009 | | | | | | A | | | A | | | | | | | | |
| Health Sciences | 511102 | A | | | X | | | | | | | | A | | | | | |
| Pre-Pharmacy | 511103 | | | | | | | A | | | | | | | | | | |
| Substance Abuse/Addiction Counseling[18] | 511501 | | | A | A | | | | | | | A | A | | | | | |
| Pharmacy[19] | 512001 | | | | | | | | | | | | | | | | A | |
| Public Health[20] | 512201 | A | | | A | | | | | | | | A | | | | A | |
| Occupational Health and Industrial Hygiene | 512206 | | | | | | | | | | | | | | A | | | |
| Physical Therapy | 512308 | | | | | | | | | | | | | | | | A | |
| Anthrozoology | 512313 | A | | | | | | | | | | | | | | | | |
| Dietetic Technician | 513103 | | | | | | A | | | | | | | | | | | |
| Registered Nursing | 513801 | A | A | | A | | | A | | A | A | | A | A | A | | | |
| Practical Nursing | 513901 | | A | X | A | | A | A | X | | A | | | | X | | | |
| Nursing Assistant | 513902 | | | | | | | | A | | | | | | | | | |
| Business[21] | 520101 | A | A | A | A | A | A | | | A | | A | A | A | A | A | A | A |
| Accounting | 520301 | A | | | | | | | | | | A | A | | | A | A | |
| Accounting Technology | 520302 | | A | | A | A | A | A | A | A | A | | A | | X | | | |
| Administrative Assistant | 520401 | | A | X | X | | X | A | A | | A | | | | X | | | |
| Customer Relations | 520406 | | | | | | | | | | A | | | | | | | |
| Office Technology | 520407 | | X | | X | | | A | X | A | | | | | X | | | |
| Entrepreneurship | 520701 | | | | | | X | A | | X | | | | | | | A | |
| Small Business Management | 520703 | | | | A | | | | | A | | | | | | | | |
| Finance | 520801 | A | | | | | | | | | | A | | | | | A | |

*A = Active. More than one graduate average over the last three academic years.*
*X = Program existed, but is not currently active. One or fewer average graduates per year over the last three academic years.*

## FIGURE A.3 (CONTINUED)

## PROGRAMS PRODUCING GRADUATES AT EACH COLLEGE

| Program Description | CIP | Carroll | City C | Dawson | FVCC | Gallatin | Great Falls C | Helena C | Highlands | Miles CC | Missoula C | MSU-Billings | MSU-Bozeman | MSU-Northern | MT-Tech | Rocky Mtn | UM-Missoula | UM-Western |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hospitality Management | 520901 | | | | X | | | | | | | | | | | | | |
| Human Resources | 521001 | | A | | X | | | | | | | | | | | | | |
| Management Information Systems | 521201 | | | | | | | | | | | | | | | | A | |
| Marketing | 521401 | | | | X | | | | | X | A | A | | | | | A | |
| Real Estate | 521501 | | | | X | | | | | | | | | | | | | |
| History | 540101 | A | | | | | | | | | | A | A | | | A | A | A |

*A = Active. More than one graduate average over the last three academic years.*
*X = Program existed, but is not currently active. One or fewer average graduates per year over the last three academic years.*

### Notes on Specific Program Classifications:

1. *Agricultural Business and Management (010101) and Agricultural Technology (010102) tie to the same two occupations. MSU-N Ag Tech program is coded as 010101.*
2. *Agricultural Production (010301) and Livestock Management (010906) tie to the same occupations. Both are coded under Ag Production.*
3. *Environmental Science (030103) and Environmental Studies (030104) lead to the same occupations. They are both coded as Environmental Science.*
4. *Forestry (030501) and Natural Resource Management Policy (030201) lead to the same occupations. Both are coded as Forestry. Rocky Mountain program 030201 coded as forestry.*
5. *Geological Engineering (143901) and Mining Engineering (142101) tie to the same occupations. Both are coded as 143901.*
6. *Drafting Design Technology (151301) and Computer Aided Design (151302) tie to the exact same occupations so they are both coded as 151301.*
7. *Foreign Languages and Literatures (160101) also includes Classical Language from Carroll because they tied to the same occupations. Foreign Languages and Literatures (160101), French (160901), Spanish (160905) and Latin (161203) lead to the same occupations. All are coded as 160101.*
8. *Classics (161200), Linguistics (160102), Russian (160402), Japanese (160302), and German (160501) all lead to the same occupations. All are coded as 160102.*
9. *Law (220101) includes Energy, Environmental, and Natural Resources Law (220207) because only projected job tied to 220207 is Lawyers.*
10. *English Writing (231301) and Professional and Technical Writing (231303) lead to the same occupations. Both are coded as English Writing.*
11. *Creative Writing (231302) and English Literature (231401) tie to almost the same occupations. Creative writing includes post-secondary teachers, all other. Both are coded as creative writing.*
12. *General Studies (240102) and Liberal Studies (240101) tie to the same occupations. 240102 code is used. Multidisciplinary Major (309999) is grouped with General Studies as well because it does not tie to any occupations*
13. *Fire Science (430201) links to the same jobs as 430203 but 430203 has one extra occupation so that is the code used.*
14. *Political Science (451001) and International Relations (450901) lead to the same occupations. They are both coded under Political Science.*
15. *Healthcare Office Management (510701) and Medical Information Technology (510706) tie to the same occupation. Coded as 510701.*
16. *Health Information Technology (510707) also includes Health Information Technology (512706). These appear to be the same types of programs. Both are in healthcare, but 512706 doesn't tie to any healthcare occupations.*
17. *Medical Admin Assistant (510716), Medical Reception (510801) and Medical Assistant (510712) all tie to Medical Assistant occupation. 510716 also ties to Medical Secretary, so this code is used.*
18. *Substance Abuse and Addiction Counseling (511501) also includes the code 512399 at MSU-Billings because the program seems to be about mental health and substance abuse counseling.*
19. *Pharmacy (512001) includes Pharmaceutics, Drug Design/ Medicinal Chemistry (512003) because the only projected job tied to 512003 is Pharmacists.*
20. *Public Health, General (512201) includes Public Health (512207) and Community Health (511504). 512201 includes Medical and Health Service Managers, and Health Science teachers, postsecondary.*
21. *Business Admin (520201) and Business General (520101) tie to the exact some occupations so they are grouped together. Organizational Communication (090901) at MSU Billings doesn't have any occupations tied to it, so it is grouped with business based on the program description.*

## A.1.3 Timeframes Used to Match Wages

Graduates completed their programs in either the 2nd quarter (May), 3rd quarter (July), or 4th quarter (December) of each year. Graduation dates were determined based on the term of graduation. The date an individual is awarded their degree may not be at the end of their last term if, for example, the student had outstanding fees. No graduation term fell within the 1st quarter. The graduates' wages were compared five years prior to graduation through five years after graduation. Graduates were matched to the wage files to determine total wages for the following time periods:

- The first two quarters after graduation,
- The first four quarters before and after graduation,
- Quarters 5 through 8 (two years) before and after graduation,
- Quarters 9 through 12 (three years) before and after graduation,
- Quarter 13 through 16 (four years) before and after graduation, and
- Quarters 17 through 20 (five years) before and after graduation.

The wage summaries are based on quarters before and after graduation to equally compare individuals across quarters. For example, a graduate in the second quarter of 2012 would have two quarters to find a job before 2013, but a graduate in the fourth quarter of 2012 would not have any time to find a job before the start of 2013. If we simply used graduation years in the analysis by pooling all graduates in 2012 together, we would be placing these two candidates in the same pool and evaluating whether they were employed in 2013, even though they had different amounts of time to find a job and earn higher wages. Instead, this analysis uses the quarters after graduation to calculate total wages in the four quarters after graduation. A 2012 second quarter graduate is evaluated on the four quarters after graduation of 2012Q3 through 2013Q2. A 2012 fourth quarter graduate is also compared on four quarters after graduation of 2013Q1 through 2013Q4. This distinction places the same evaluation timeframe on graduates with different quarters.

## A.1.4 Wage Data Background

The wage data used in the match comes from the mandatory reporting of payroll wages by employers to the MTDLI for UI program purposes. The wages reported are the total amount of wages earned by a worker in a quarter. The wages reported cannot be used to assume an hourly or annual rate of pay because there is no information on the number of hours or months worked by the graduate, therefore the wages reported are better interpreted as wage earnings. Some workers will have higher wages due to overtime hours worked, while other workers will have low wages because they only worked a few hours or only part of a quarter. The presence of wages only suggests that the worker earned some wages from an employer.

Not all wage earnings are reported to MTDLI. Some payroll workers, such as migrant agriculture workers and railroad workers do not pay into the UI system. Some federal agencies report their payroll wages nationally instead of to each state. Self-employed workers or independent contractors are not payroll workers and are not required to pay into the UI system (although self-employed workers can opt into the system). All of these types of workers could be earning income in Montana that is not reported to the UI system and therefore will not show up in the matched wage data. The income match does not include such income.

For most of the data provided in this report (with the exception of the match to employer location and industry), wages earned from all employers were summed into total earnings for the graduate. For example, if a graduate held two jobs, each earning $3,000 per quarter, their wages reflect the total $6,000 earned per quarter. Annual wages are the sum of quarterly wage earnings from all employers.

## A.1.5 Income Tax Data

The income data used in this report comes from the mandatory reporting of personal income to the Montana Department of Revenue (DOR) to calculate state income tax liability. Individuals report their income annually based on a calendar year. Total income reported in this study is the sum of all income types shown in **Figure A.4** for an individual. The income types are limited to earned income, with the exception of rental property income in line 17. Earned income provides the most accurate measure of an individual's earning capacity. This study excludes passive income and income transfers, such as capital gains, unemployment, and social security benefits.

FIGURE A.4

### INCOME TYPES INCLUDED BY LINE ITEM ON TAX RETURN

| Line Item | Description | Example |
|---|---|---|
| 7 | Wages, salaries, tips, etc. | Wage Income |
| 12 | Business income (or loss) | Sole-Proprietor Income |
| 17 | Rental real estate, royalties, partnerships, S corporations, trusts | Partnership Income |
| 18 | Farm income (or loss) | Sole-Proprietor Farm Income |

The income tax data captures self-employment and business earnings that the wage data is unable to measure. The income tax data is also able to better identify whether graduates remain in the state after graduation. If the individual does not appear in the wage data, then they may have moved out of Montana, be self-employed, or work for Montana employer not paying UI taxes. The income data better identifies a graduate's location. An individual is a resident in a given year if they filed income taxes as a Montana resident in that year.

An individual can file as single, married filing jointly, head-of-household, or married filing separately on the same or separate forms. If an individual filed as single, head-of-household, or married filing separately on different forms, then all of the income listed on the return is attributed to the individual. For the purposes of this study, all individuals who filed their income tax returns as married filing jointly have all the income listed in columns A and B of their return attributed to them even though the income was earned between two individuals. There is no way to correctly identify one individual's income from the others on a joint return, so the total is attributed to both people. About 13% of graduates matched to joint returns. Lastly, for those who filed as married filing separately on the same return, the total income is split out between the two people based on the income reported in column A and B. In this study, if an individual filed as married filing separately on the same return, only the income reported in the column associated with their social security number is attributed to them.

## A.1.6 Matching Income Tax and Graduate Data

Montana income tax data from 2002 to 2015 was matched to the graduate data to determine graduates' income one year, three years, and five years after graduation. The timeframe used to match income data was determined based on the calendar year of graduation. For example, graduates in the spring, summer, and fall of 2001 matched to income tax data from 2002 to determine their income one year after graduation. These graduates also matched to income data from 2004 and 2006 to determine their income three and five years after graduation, respectively. Matching based on calendar year of graduation allows individuals graduating in the spring longer to generate income after graduation than fall graduates. However, because individuals only report their income to DOR annually, the match had to be done by calendar year.

Income data five years after graduation was available for individuals graduating in 2001 to 2010. Data three years after graduation was available for graduates in 2001 to 2012, and data one year after graduation was available for graduates in 2001 to 2014. No income tax data was available for individuals graduating in 2015.

The graduate data used in the match was uniquely identified by degree. Income was assessed directly after graduation, even if the individual remained in school. If an individual graduated from multiple schools, or received multiple degrees, their income was counted once for each degree they earned. Only 22% of individuals in the graduate data received multiple degrees (Table 1). Programs where it is common for individuals to continue on to higher education may have lower reported incomes initially.

DOR maintains Montana income tax data, and confidentiality requirements restrict the release individual records. DOR conducted the individual-level match and released aggregate data to MTDLI, as outlined in the MOU between MTDLI and DOR. DOR provided MTDLI with income tax data for the following aggregations:

- By campus
- By program
- By degree by program
- By degree
- By age group

DOR provided MTDLI with data for each aggregation by calendar year so that MTDLI could adjust the income for inflation. Any aggregation in a calendar year that matched to less than ten individual income tax records was suppressed to protect individual tax information. For each releasable aggregation, DOR provided the following summary statistics one year, three years, and five years after graduation:

- Percent filing in tax year
- Average total earned income
- 25th percentile of total earned income
- Median total earned income
- 75th percentile of total earned income

After receiving the aggregated income tax data, MTDLI adjusted the income by calendar year so that it reflects 2015 dollars. Changes in the annual CPI-U was used to measure inflation.[24] MTDLI used the real income tax data to generate summary statistics across all years.

24 *The CPI-U stands for the Consumer Price Index for All Urban Consumers. U.S. Bureau of Labor statistics publishes the CPI-U as a measure that examines the changes in price of a basket of goods and services purchased by urban consumers. The index measures national changes in prices, and does not capture price changes specific to Montana.*

## A.1.7 Program Categorizations for Income Data Match

Only income data for 58 of the 230 programs were releasable in the program-level match. To increase the amount of releasable data, MTDLI condensed the remaining 172 programs into 38 program categories shown in **Figure A.5**. **Figure A.5** lists the programs from **Figure A.3** included in each category. In total, 96 unique programs were identified in the income data match.

### FIGURE A.5
### PROGRAM CATEGORIES FOR INCOME DATA MATCH

| Program Category | CIP Code | Programs Included (from Figure A.3) |
|---|---|---|
| Agriculture | 010000 | 010101, 010205, 010301, 010308, 010401, 010507 |
| Plant Science | 011100 | 011101, 011106 |
| Natural Resource Conservation & Mgmt | 030000 | 030101, 030206, 030299 |
| Mass Communication | 090000 | 090102, 090701 |
| Computer/Info Science, Other | 110000 | 110201, 110301, 110401, 110501, 110801, 110901, 111001, 111003, 111004, 111006 |
| Personal and Culinary Services | 120000 | 120402, 120503, 120504, 520901 |
| Education, General | 130000 | 130101, 130607 |
| School Counselor | 131101 | 131101, 422805 |
| Secondary Education | 131300 | 131205, 131206, 131301, 131302, 131303, 131305, 131309, 131311, 131312, 131314, 131315, 131316, 131317, 131318, 131320, 131321, 131322, 131323, 131328, 131330, 131334, 131337, 131401, 131501 |
| Mechanical Engineering | 140000 | 141901, 142001 |
| Engineering, General | 140101 | 140101, 140901, 140903 |
| Engineering Technologies, Other | 150000 | 150201, 150303, 150499, 150503, 150506, 150611, 150612, 150799, 150903, 151102, 151202, 151501 |
| Law | 220100 | 220101, 220207 |
| Legal Support/Paralegal | 220300 | 220301, 220302 |
| Writing | 231300 | 231301, 231302 |
| General Studies | 240102 | 50299, 240102 |
| Physical Science, Other | 260000 | 260202, 260204, 260401, 260702, 261004, 261201, 261301, 261305, 261501, 400101, 410101 |
| Mathematics/Stats | 270000 | 270101, 270301, 270501 |
| Parks & Recreation | 310000 | 310101, 310399 |
| Philosophy/Theology | 380000 | 380101, 380103, 390601 |

*NOTES: The "programs included" column lists program CIP codes from Table 3. The fifty-eight programs from Table 3 that are not listed above were also included in the match, but were not combined with any other program.*

## FIGURE A.5 (CONTINUED)
## PROGRAM CATEGORIES FOR INCOME DATA MATCH

| Program Category | CIP Code | Programs Included (from Figure A.3) |
|---|---|---|
| Public Safety | 430000 | 430102, 430104, 430107, 430203 |
| Public Administration | 440401 | 440201, 440401 |
| Social Science, General | 450000 | 190101, 301101, 450101, 450702, 451301 |
| Construction | 460000 | 460201, 460302, 460303, 460401, 460503 |
| Mechanic Repair Tech | 470000 | 470105, 470201, 470606, 470607 |
| Automotive Technology | 470600 | 470603, 470604 |
| Metal Tech | 480000 | 480501, 480508, 480510, 480511 |
| Transportation and Material Moving | 490000 | 490102, 490104, 490202 |
| Visual and Performing Arts | 500000 | 500101, 500301, 500408, 500409, 500501, 500502, 500713 |
| Health Science, Other | 510000 | 190501, 510204, 512201, 512313, 511102, 511103, 511501, 512206 |
| HIT and Medical Coding | 510700 | 510707, 510708, 510713 |
| Health Diagnostic/Intervention/Treatment | 510900 | 510904, 510911, 510913 |
| Health Tech/ Assistant | 511000 | 510601, 510602, 511004, 511005, 511009, 513103, 510805, 510806, 513902 |
| Pharmacy | 512000 | 512001, 512003 |
| Business | 520101 | 520101, 520701, 520703, 521001, 521201, 521501 |
| Administrative Assistant | 520400 | 520401, 520406, 520407 |
| History | 540101 | 301201, 540101 |

*NOTES: The "programs included" column lists program CIP codes from Table 3. The fifty-eight programs from Table 3 that are not listed above were also included in the match, but were not combined with any other program.*

Of the 96 unique programs defined for the income data match by program, only data from 37 programs were releasable by degree. The remaining programs were combined based on their CIP code to create more general program categories. Table 6 shows the combined programs for the program-degree-level match. The last column of **Figure A.6** lists the programs from **Figure A.5** that were combined to generate the new program categories.

FIGURE A.6

## DEGREE AND PROGRAM CATEGORIES FOR INCOME DATA MATCH

| Degree | CIP | Program Category | Programs Included (from Table 5) |
|---|---|---|---|
| Certificate | 460000 | Construction Tech | 460000, 470000, 470600, 470605, 480000, 490000 |
| | 510000 | Health Science | 310501, 510000, 510700, 510701, 510716, 510908, 510909, 511000, 513901 |
| | 520000 | Business | 520101, 520302, 520400, 521401 |
| Associate | 110000 | Computer Science and IT | 110000, 110103, 110701 |
| | 130000 | Education | 130000, 131001, 131202, 131210, 131300 |
| | 150000 | Engineering Tech | 150000, 151001, 151301 |
| | 440000 | Human Services | 430000, 440000 |
| | 460000 | Construction Tech | 460000, 470000, 470600, 470605, 480000, 490000 |
| | 510000 | Health Science | 510000, 510700, 510701, 510716, 510900, 510908, 510909, 511000 |
| | 520101 | Business | 520101, 521401 |
| Bachelor's | 030500 | Forestry and Wildlife Mgmt | 30501, 30601 |
| | 040201 | Architecture | 40201, 40401 |
| | 090000 | Communication | 90000, 90101 |
| | 090401 | Journalism and PR | 90401, 90902 |
| | 119999 | Computer/Info Science, Other | 110000, 110103 |
| | 149999 | Engineering, Other | 140701, 141401, 142501, 143501, 143901 |
| | 150000 | Engineering Tech | 150000, 150805, 151001, 151301 |
| | 160000 | Language and Linguistics | 160101, 160102 |
| | 230000 | English and Writing | 230101, 231300 |
| | 269999 | Physical Science, Other | 260000, 400501, 400801 |
| | 440000 | Human Services | 430000, 440000, 440401, 440701 |
| | 459999 | Social Science, Other | 380000, 420101, 450000, 450601, 450701 |
| | 460000 | Construction Tech | 470600, 470605, 490000 |
| | 500000 | Visual and Performing Arts | 500000, 500602, 500903 |

## FIGURE A.6 (CONTINUED)

## DEGREE AND PROGRAM CATEGORIES FOR INCOME DATA MATCH

| Degree | CIP | Program Category | Programs Included (from Table 5) |
|---|---|---|---|
| Bachelor's (Continued) | 510000 | Health Science | 510000, 510700, 510701, 510900, 510912, 511000, 512000 |
| | 520101 | Business | 520101, 521401 |
| | 520301 | Accounting and Finance | 520301, 520801 |
| Master's | 030000 | Natural Resource & Conservation | 030000, 030103, 030501, 030601 |
| | 131000 | Elementary and Secondary Ed | 131202, 131210, 131300 |
| | 139999 | Education, Other | 131001, 131101 |
| | 140000 | Engineering | 140000, 140101, 140701, 140801, 141001, 141401, 142501, 143501, 143901 |
| | 240000 | English, Language, Writing & Comm. | 090101, 090401, 090902, 160101, 160102, 230101, 231300, 240102 |
| | 400000 | Physical Science | 260000, 260101, 260502, 270000, 400501, 400601, 400801 |
| | 450000 | Social Science | 380000, 420101, 450000, 450201, 450601, 450701, 451001, 451101 |
| | 500000 | Visual and Performing Arts | 500000, 500602, 500903 |
| | 510000 | Health Science | 310501, 310505, 510000, 510701, 510900, 510912, 512000, 513801 |
| Doctoral | 400000 | Physical Science | 260000, 260101, 260502, 270000, 400501, 400601, 400801 |

After re-categorizing programs for the program-level, and program-degree-level income data match, there were still income data that was not releasable in every calendar year for every program, and program-degree combination. Thirty-eight programs did not meet the confidentiality requirements for graduates in 2001 in the program-level match. Those programs are shown in **Figure A.7**. The aggregate income data for these programs only include graduates from 2002 to 2014. **Figure A.8** shows the program-degree combinations with missing income data and the years missing. The year listed represents the graduation year, not the income tax year.

## FIGURE A.7
## PROGRAMS MISSING 2001 GRADUATES IN INCOME DATA MATCH

| CIP | Program Description | CIP | Program Description |
|---|---|---|---|
| 030601 | Fish and Wildlife Management | 430000 | Public Safety |
| 090000 | Mass Communication | 440000 | Human Services |
| 090902 | Public Relations | 450000 | Social Science, General |
| 120000 | Personal and Culinary Services | 450701 | Geography |
| 130301 | Curriculum and Instruction | 460000 | Construction |
| 131101 | School Counselor | 470000 | Mechanic Repair Tech |
| 131210 | Early Childhood Education | 470600 | Automotive Technology |
| 140701 | Chemical Engineering | 480000 | Metal Tech |
| 141401 | Environmental Engineering | 490000 | Transportation and Material Moving |
| 143501 | Industrial Engineering | 500903 | Music |
| 143901 | Geological/Geophysical/Mining Engineering | 510700 | HIT and Medical Coding |
| 150805 | Mechanical Engineering Technology | 510701 | Health Care Office Management |
| 151301 | Drafting and Design Technology | 510716 | Medical Admin Assistant |
| 160102 | Linguistics | 510900 | Allied Health Diagnostic, Intervention, Treatment |
| 220100 | Law | 510908 | Respiratory Care |
| 220300 | Legal Support/Paralegal | 510909 | Surgical Technology |
| 231300 | Writing | 510912 | Physician Assistant |
| 380000 | Philosophy/Theology | 512308 | Physical Therapy |
| 400501 | Chemistry | 520801 | Finance |

FIGURE A.8

## CALENDAR YEARS OF INCOME DATA MISSING BY DEGREE AND PROGRAM

| Degree Description | CIP | Program | Years Missing |
|---|---|---|---|
| Certificate | 510000 | Health science | 2003 2004 |
| | 510000 | Business | 2002 2003 2004 2006 2007 |
| Associate | 110000 | Computer science and IT | 2001 |
| | 460000 | Construction tech | 2001 |
| | 510000 | Health science | 2001 |
| Bachelor's | 119999 | Computer/Info Science, Other | 2002, 2004-2013 |
| | 269999 | Physical Science, Other | 2001 |
| | 030500 | Forestry and Wildlife Management | 2001 |
| | 510000 | Health Science | 2001 2005 2006 2008 2009 2010 |
| Master's | 240000 | General Studies | 2001 |
| | 500000 | Visual and Performing Arts | 2002-2005 and 2007 |
| | 510000 | Health Science | 2001 |
| Doctoral | 400000 | Physical Science | 2001 |

## A.2 Supply and Demand Methodology

The supply and demand analysis conducted in this report is often referred to a gap analysis because it identifies gaps in the supply of workers meeting business needs. The report generally avoids the term gap analysis because the concept is more accurately described as a supply and demand analysis. However, the term gap analysis is used here for conciseness.

The purpose of the gap analysis is to determine if there are enough graduates produced by Montana college programs to meet estimated demand in Montana. The gap analysis uses the MTDLI 2015-2025 employment projections data as an estimate of workforce demand. Worker supply is estimated based on graduation data from the Montana University System maintained by OCHE, and data from Rocky Mountain College, and Carroll College, which was provided by the individual colleges. Worker supply data includes eighteen colleges, approximately 100,000 graduates and 113,000 degrees in 230 programs for the 14 academic years from 2001-02 to 2014-15.

The gap analysis is presented from three different perspectives – by industry, occupation, and program of study. Each analysis categorizes the occupation, program or industry as undersupplied, meets demand or oversupplied by Montana colleges. The results from these analyses are then compared to graduate workforce outcomes by program to confirm or refute the prior conclusions. Presenting gap analysis from three different perspectives is necessary to overcome flaws inherent with this type of analysis and provide greater confidence in research conclusions.

## A.2.1 Description of Employment Projections Data

Every year, the MTDLI produces employment forecasts for the state of Montana in conjunction with the U.S. Department of Labor. The employment forecasts are produced over a two-year and ten-year time frame, by industry and occupation, and either statewide or geographically by region. The projections are based on historic employment data from January 1990 to December 2015. The primary data source for the Montana industry employment projections is the Quarterly Census of Employment and Wages (QCEW), which is published jointly by the Bureau of Labor Statistics and the MTDLI.

The employment forecasts are an estimate of the future demand for workers based on historical employment data, coupled with knowledge that is available at the time of the forecast. Because the economy is constantly changing, the forecasts are not going to be exactly right. Instead, the employment forecasts should be seen as the most likely employment growth outcome of all possible outcomes, given the current knowledge and information about the economy.

Occupations are classified as either high demand, or very-high demand occupations based on the total projected openings. Very-high demand occupations are occupations with total annual openings in the 90th percentile within an education level. Similarly, occupations with total annual openings in the 75th percentile within an educational level are considered high demand occupations. **Figure A.9** summarizes the threshold for very-high and high demand occupations for each education level and each region. For example, occupations in Montana requiring an associate degree were considered in very-high demand if the projected total annual openings for the occupation are at or above 25 openings. If an occupation is projected to have at least ten, but less than 25, total annual openings, then the occupation is considered to be in high demand in Montana among occupations requiring an associate degree.

FIGURE A.9

### Thresholds for High-Demand and Very High-Demand Occupations by Education and Region

| Region | Demand Level | Some college, no degree | Postsecondary non-degree award | Associate degree | Bachelor's degree | Master's degree | PhD or professional degree |
|---|---|---|---|---|---|---|---|
| MONTANA | Very High | 103 | 50 | 25 | 41 | 23 | 15 |
| | High | 93 | 20 | 10 | 20 | 15 | 5 |
| NORTHWEST | Very High | 32 | 18 | 10 | 12 | 6 | 4 |
| | High | 28 | 6 | 3 | 6 | 5 | 2 |
| SOUTHWEST | Very High | 24 | 21 | 6 | 12 | 6 | 6 |
| | High | 24 | 7 | 4 | 7 | 5 | 2 |
| NORTH CENTRAL | Very High | 19 | 11 | 3 | 4 | 4 | 1 |
| | High | 11 | 3 | 1 | 2 | 2 | 1 |
| SOUTH CENTRAL | Very High | 22 | 11 | 4 | 8 | 5 | 4 |
| | High | 16 | 4 | 3 | 4 | 3 | 2 |
| EASTERN | Very High | 18 | 5 | 2 | 3 | 1 | 1 |
| | High | 6 | 2 | 1 | 1 | 1 | 0 |

*Source: MTDLI 2015-2025 employment projections.*
*Notes: Very high-demand represents 90th percentile of total annual openings, high-demand represents the 75th percentile.*

## A.2.2 Crosswalk between Programs and Occupations

In order to match college programs with their corresponding occupations, the U.S. Department of Labor and the U.S. Department of Education provide a crosswalk between the standard occupational classification (SOC) codes and the classification of instructional programs (CIP) codes. The crosswalk used in this report matches the 2010 SOC codes with the 2010 CIP codes. The crosswalk matches each program with the entire list of occupations an individual may be prepared to fill upon obtaining a degree in the program. Similarly, for each occupational code the crosswalk provides a list of programs that may train an individual to work in the occupation. The match is not one-to-one, meaning that a program may prepare a student for multiple occupations, and an occupation may be filled by students holding degrees from many different programs. For example, a student graduating with a practical nursing degree matches directly to the practical nursing occupation. However, a culinary arts graduate matches to five different occupations.

The 230 academic programs at Montana colleges match to 357 occupations. There are four programs that do not tie to any occupation projected in Montana – nondestructive testing, health sciences, pre-pharmacy, and process plant technology. These programs were excluded from the gap analysis. The remaining occupations are categorized into 96 programs, as described in Section A.1.7. The crosswalk between programs and occupations were condensed so that each occupation was only listed once for each program.

The programs at Montana colleges train graduates to fill 357 occupation. About 71% of the occupations require some college education. The other 29% typically only require a high school diploma or less, although having more than the required education usually improves wage outcomes. About 30% of the occupations trained by programs at Montana colleges are considered to be in high-demand.

Most programs prepare students to work in multiple occupations. **Figure A.10** shows the top three occupations associated with each program that have the highest projected total annual job openings. The same occupation may be listed under multiple programs if graduates from more than one program are trained to fill the occupation.

FIGURE A.10

## TOP OCCUPATIONAL EMPLOYMENT PROJECTIONS FOR COLLEGE PROGRAMS

| Program Category | Program | SOC | Occupation | MT Growth Openings | MT Total Openings |
|---|---|---|---|---|---|
| Agriculture and Natural Resource | Agriculture | 493042 | Mobile Heavy Equipment Mechanics | 7 | 31 |
| | | 191031 | Conservation Scientists | 7 | 28 |
| | | 493041 | Farm Equipment Mechanics & Techs | 5 | 18 |
| | Animal Science | 251041 | Agricultural Sciences Teachers* | NA | 2 |
| | Plant Science | 191031 | Conservation Scientists | 7 | 28 |
| | | 191013 | Soil & Plant Scientists | 2 | 9 |
| | | 251041 | Agricultural Sciences Teachers* | NA | 2 |
| | Natural Resource Conservation & Mgmt | 191031 | Conservation Scientists | 7 | 28 |
| | | 191032 | Foresters | 2 | 24 |
| | Environmental Science | 192041 | Environmental Scientists & Specialists | 7 | 19 |
| | | 251053 | Environmental Science Teachers* | 1 | 3 |
| | Forestry | 191031 | Conservation Scientists | 7 | 28 |
| | | 191032 | Foresters | 2 | 24 |
| | Fish & Wildlife Mgmt | 191031 | Conservation Scientists | 7 | 28 |
| | | 191023 | Zoologists & Wildlife Biologists | 3 | 11 |
| | | 333031 | Fish & Game Wardens | 1 | 4 |
| Architecture | Architecture | 171011 | Architects, excl Landscape & Naval | 10 | 20 |
| | | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 251031 | Architecture Teachers* | NA | 1 |
| | Environmental Design/ Architecture | 171011 | Architects, excl Landscape & Naval | 10 | 20 |
| | | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 171012 | Landscape Architects | 1 | 2 |
| Communication | Mass Communication | 272012 | Producers & Directors | 4 | 14 |
| | | 273041 | Editors | 1 | 13 |
| | | 273022 | Reporters & Correspondents | 2 | 12 |
| | Communication Studies | 273031 | Public Relations Specialists | 9 | 20 |
| | | 273043 | Writers & Authors | NA | 7 |
| | | 273011 | Radio & Television Announcers | NA | 4 |
| | Journalism | 273041 | Editors | 1 | 13 |
| | | 273022 | Reporters & Correspondents | 2 | 12 |
| | | 273043 | Writers & Authors | NA | 7 |
| | Public Relations | 112031 | PR & Fundraising Mgrs | NA | 26 |
| | | 112011 | Advertising & Promotions Mgrs | NA | 25 |
| | | 273031 | Public Relations Specialists | 9 | 20 |
| Computer/Info Science | Computer/Info Science, Other | 151151 | Computer User Support Specialists | 42 | 73 |
| | | 151131 | Computer Programmers | 15 | 51 |
| | | 151132 | Software Developers, Applications | 20 | 37 |
| | Information Technology | 151132 | Software Developer, Applications | 20 | 37 |
| | | 151133 | Software Developer, System Software | 16 | 26 |
| | | 151121 | Computer Systems Analysts | 16 | 24 |
| | Computer Science | 151131 | Computer Programmers | 15 | 51 |
| | | 151132 | Software Developers, Applications | 20 | 37 |
| | | 151134 | Web Developers | 18 | 35 |

*Source: MTDLI 2015-2025 occupational employment projections. SOC to CIP crosswalk, U.S. Dept. of Education and U.S. Dept. of Labor Occupational titles are abbreviated. U.S. DOL provides official information about each SOC code. *= postsecondary. NA = Not Available.*

FIGURE A.10 (CONTINUED)

## TOP OCCUPATIONAL EMPLOYMENT PROJECTIONS FOR COLLEGE PROGRAMS

| Program Category | Program | SOC | Occupation | MT Growth Openings | MT Total Openings |
|---|---|---|---|---|---|
| Culinary Arts and Recreation | Personal & Culinary Services | 352014 | Cooks, Restaurant | 87 | 210 |
| | | 351012 | Food Prep & Serving FLS | 53 | 162 |
| | | 119051 | Food Service Managers | 5 | 14 |
| | Parks & Recreation | 111021 | General & Operations Managers | 60 | 177 |
| | | 119199 | Managers, All Other | 7 | 58 |
| | Health & PE/Fitness, General | 272022 | Coaches & Scouts | 7 | 57 |
| | | 399031 | Fitness & Aerobics Instructors | 24 | 47 |
| Education | Education, General | 259099 | Ed, Training, & Library Workers | 1 | 4 |
| | | 251081 | Education Teachers* | NA | 3 |
| | | 193099 | Social Scientists & Related Workers | NA | 1 |
| | Curriculum & Instruction | 259031 | Instructional Coordinators | 2 | 5 |
| | Education Administration | 119032 | Ed Administrator, Elem & Secondary | 2 | 22 |
| | | 119033 | Ed Administrators* | 1 | 8 |
| | | 119031 | Ed Administrators, Preschool | 1 | 6 |
| | Special Education | 252052 | Special Ed Teachers, Elementary | 2 | 17 |
| | | 252054 | Special Ed Teachers, Secondary | 2 | 14 |
| | | 252053 | Special Ed Teachers, Middle School | 1 | 5 |
| | School Counselor | 119199 | Managers | 7 | 58 |
| | | 211012 | Ed/School & Vocational Counselors | 4 | 20 |
| | | 193031 | Clinical & School Psychologists | 4 | 13 |
| | Elementary Education | 252021 | Elementary School Teachers | 20 | 107 |
| | Early Childhood Education | 252011 | Preschool Teachers | 8 | 38 |
| | | 252012 | Kindergarten Teachers | 2 | 14 |
| | Secondary Education | 252021 | Elementary School Teachers | 20 | 107 |
| | | 259041 | Teacher Assistants | 14 | 103 |
| | | 252031 | Secondary School Teachers | 8 | 83 |
| Engineering | Mechanical Engineering | 131051 | Cost Estimators | 22 | 55 |
| | | 172141 | Mechanical Engineers | 9 | 22 |
| | | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | Engineering, General | 151132 | Software Developers | 20 | 37 |
| | | 151133 | Software Developers | 16 | 26 |
| | | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | Chemical Engineering | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 251032 | Engineering Teachers* | 2 | 5 |
| | | 172041 | Chemical Engineers | 1 | 3 |
| | Civil Engineering | 172051 | Civil Engineers | 16 | 58 |
| | | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 251032 | Engineering Teachers* | 2 | 5 |
| | Electrical & Electronics Engineering | 172071 | Electrical Engineers | 6 | 18 |
| | | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 251032 | Engineering Teachers* | 2 | 5 |

*Source: MTDLI 2015-2025 occupational employment projections. SOC to CIP crosswalk, U.S. Dept. of Education and U.S. Dept. of Labor*
*Occupational titles are abbreviated. U.S. DOL provides official information about each SOC code. *= postsecondary. NA = Not Available.*

## FIGURE A.10 (CONTINUED)

## TOP OCCUPATIONAL EMPLOYMENT PROJECTIONS FOR COLLEGE PROGRAMS

| Program Category | Program | SOC | Occupation | MT Growth Openings | MT Total Openings |
|---|---|---|---|---|---|
| Engineering (Continued) | Environmental Engineering | 172081 | Environmental Engineers | 8 | 17 |
| | | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 251032 | Engineering Teachers* | 2 | 5 |
| | Petroleum Engineering | 172171 | Petroleum Engineers | 5 | 18 |
| | | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 251032 | Engineering Teachers* | 2 | 5 |
| | Industrial Engineering | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 172112 | Industrial Engineers | 3 | 10 |
| | | 251032 | Engineering Teachers* | 2 | 5 |
| | Geological/Geophysical/ Mining Engineering | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 172199 | Engineers | 1 | 6 |
| | | 251032 | Engineering Teachers* | 2 | 5 |
| Engineering Technologies | Engineering Technologies, Other | 518031 | Water Treatment Plant Operators | 5 | 16 |
| | | 119041 | Architectural & Engineering Mgrs | 4 | 12 |
| | | 173022 | Civil Engineering Technicians | 4 | 12 |
| | Construction Engineering Technology | 131051 | Cost Estimators | 22 | 55 |
| | | 119021 | Construction Managers | 7 | 32 |
| | | 173022 | Civil Engineering Technicians | 4 | 12 |
| | Drafting and Design Technology | 173011 | Architectural & Civil Drafters | 3 | 10 |
| | | 173012 | Electrical & Electronics Drafters | 2 | 4 |
| | | 173013 | Mechanical Drafters | 1 | 3 |
| Liberal Arts | Foreign Languages and Literatures | 252031 | Secondary School Teachers | 8 | 83 |
| | | 251124 | Foreign Language & Lit Teachers* | 1 | 2 |
| | | 273091 | Interpreters & Translators | 1 | 1 |
| | Linguistics | 251124 | Foreign Language & Lit Teachers* | 1 | 2 |
| | | 273091 | Interpreters & Translators | 1 | 1 |
| | Philosophy/Theology | 212011 | Clergy | 10 | 25 |
| | | 251126 | Philosophy & Religion Teachers* | 1 | 2 |
| | Visual and Performing Arts | 271024 | Graphic Designers | 8 | 27 |
| | | 272012 | Producers & Directors | 4 | 14 |
| | | 274021 | Photographers | NA | 8 |
| | Cinematography and Film | 272012 | Producers & Directors | 4 | 14 |
| | | 251121 | Art, Drama, & Music Teachers* | 1 | 4 |
| | | 274032 | Film & Video Editors | 2 | 3 |
| | General Studies | 251199 | Postsecondary Teachers, All Other | 1 | 4 |
| | | 251062 | Area/ Ethnic/ Cultural Study Teacher* | 1 | 2 |
| | Music | 272042 | Musicians & Singers | NA | 30 |
| | | 272041 | Music Directors & Composers | 1 | 7 |
| | | 251121 | Art, Drama, & Music Teachers* | 1 | 4 |
| | History | 252031 | Secondary School Teachers | 8 | 83 |
| | | 119199 | Managers, All Other | 7 | 58 |
| | | 251125 | History Teachers* | NA | 2 |

*Source: MTDLI 2015-2025 occupational employment projections. SOC to CIP crosswalk, U.S. Dept. of Education and U.S. Dept. of Labor*
*Occupational titles are abbreviated. U.S. DOL provides official information about each SOC code. *= postsecondary. NA = Not Available.*

## FIGURE A.10 (CONTINUED)

## TOP OCCUPATIONAL EMPLOYMENT PROJECTIONS FOR COLLEGE PROGRAMS

| Program Category | Program | SOC | Occupation | MT Growth Openings | MT Total Openings |
|---|---|---|---|---|---|
| Liberal Arts (continued) | English | 252031 | Secondary School Teachers | 8 | 83 |
| | | 251123 | English Language/ Lit Teachers* | 1 | 3 |
| | Writing | 273041 | Editors | 1 | 13 |
| | | 273043 | Writers & Authors | NA | 7 |
| | | 251199 | Postsecondary Teachers, All Other | 1 | 4 |
| Legal Professions | Law | 231011 | Lawyers | 30 | 70 |
| | | 231022 | Arbitrators/Mediators/Conciliators | NA | 3 |
| | | 231023 | Judges & Magistrates | 1 | 2 |
| | Legal Support/Paralegal | 232011 | Paralegals & Legal Assistants | 17 | 37 |
| | | 436012 | Legal Secretaries | 5 | 14 |
| | | 232093 | Title Examiners | NA | 8 |
| Physical Science | Physical Science, Other | 252031 | Secondary School Teachers | 8 | 83 |
| | | 194021 | Biological Technicians | 3 | 16 |
| | | 191023 | Zoologists & Wildlife Biologists | 3 | 11 |
| | Biology, General | 252031 | Secondary School Teachers | 8 | 83 |
| | | 191029 | Biological Scientists, All Other | 1 | 10 |
| | | 119121 | Natural Sciences Managers | 2 | 8 |
| | Microbiology | 119121 | Natural Sciences Managers | 2 | 8 |
| | | 191022 | Microbiologists | 2 | 5 |
| | | 251042 | Biological Science Teachers* | 1 | 4 |
| | Mathematics/Stats | 252031 | Secondary School Teachers | 8 | 83 |
| | | 119121 | Natural Sciences Managers | 2 | 8 |
| | | 251022 | Mathematical Science Teachers* | 2 | 5 |
| | Chemistry | 252031 | Secondary School Teachers | 8 | 83 |
| | | 119121 | Natural Sciences Managers | 2 | 8 |
| | | 192031 | Chemists | 3 | 7 |
| | Geology | 192042 | Geoscientists | 6 | 14 |
| | | 119121 | Natural Sciences Managers | 2 | 8 |
| | | 192043 | Hydrologists | 2 | 6 |
| | Physics | 252031 | Secondary School Teachers | 8 | 83 |
| | | 119121 | Natural Sciences Managers | 2 | 8 |
| | | 251054 | Physics Teachers* | 1 | 1 |
| Human Services | Public Safety | 333051 | Police & Sheriff's Patrol Officers | 13 | 63 |
| | | 119199 | Managers, All Other | 7 | 58 |
| | | 333012 | Correctional Officers & Jailers | 14 | 46 |
| | Human Services | 211093 | Social & Human Service Assistants | 17 | 42 |
| | | 119151 | Social & Community Service Mgrs | 6 | 20 |
| | | 211099 | Community/ Social Service Specialists | 5 | 15 |
| | Public Administration | 111021 | General & Operations Managers | 60 | 177 |
| | | 119199 | Managers, All Other | 7 | 58 |
| | | 111011 | Chief Executives | NA | 22 |

*Source: MTDLI 2015-2025 occupational employment projections. SOC to CIP crosswalk, U.S. Dept. of Education and U.S. Dept. of Labor*
*Occupational titles are abbreviated. U.S. DOL provides official information about each SOC code. *= postsecondary. NA = Not Available.*

## FIGURE A.10 (CONTINUED)

## TOP OCCUPATIONAL EMPLOYMENT PROJECTIONS FOR COLLEGE PROGRAMS

| Program Category | Program | SOC | Occupation | MT Growth Openings | MT Total Openings |
|---|---|---|---|---|---|
| Human Services (cont.) | Social Work | 211021 | Child, Family & Ed Social Workers | 16 | 49 |
| | | 211022 | Healthcare Social Workers | 13 | 27 |
| | | 211023 | Mental Health & Substance Abuse Social Workers | 11 | 25 |
| Social Science | Social Science, General | 252031 | Secondary School Teachers | 8 | 83 |
| | | 119199 | Managers, All Other | 7 | 58 |
| | | 191042 | Medical Scientists | 1 | 3 |
| Social Science (Continued) | Anthropology | 119199 | Managers, All Other | 7 | 58 |
| | | 193091 | Anthropologists & Archeologists | 1 | 2 |
| | Psychology | 119199 | Managers, All Other | 7 | 58 |
| | | 193031 | Clinical/Counseling/Ed Psychologist | 4 | 13 |
| | | 251066 | Psychology Teachers* | 2 | 6 |
| | Economics | 119199 | Managers, All Other | 7 | 58 |
| | | 193011 | Economists | 2 | 6 |
| | Geography | 119199 | Managers, All Other | 7 | 58 |
| | Political Science | 119199 | Managers, All Other | 7 | 58 |
| | | 251065 | Political Science Teachers* | NA | 1 |
| | Sociology | 119199 | Managers, All Other | 7 | 58 |
| | | 251067 | Sociology Teachers* | NA | 1 |
| Construction, Mechanic and Transportation | Construction | 472031 | Carpenters | 124 | 188 |
| | | 499071 | Maintenance & Repair Workers | 62 | 183 |
| | | 471011 | Construction & Extraction FLS | 82 | 106 |
| | Mechanic Repair Tech | 499021 | Heating/Air Cond./ Refrigeration Mechanics | 18 | 30 |
| | | 493011 | Aircraft Mechanics & Service Techs | 6 | 17 |
| | | 493051 | Motorboat Techs & Mechanics | 1 | 3 |
| | Automotive Technology | 493023 | Automotive Techs & Mechanics | 24 | 118 |
| | | 493021 | Automotive Body Repairers | 9 | 24 |
| | | 519122 | Painters, Transportation Equip | 2 | 5 |
| | Diesel Technology | 493031 | Bus & Truck Mechanics, Diesel | 28 | 52 |
| | Metal Tech | 514121 | Welders/Cutters/Solderers/Brazers | 14 | 56 |
| | | 514041 | Machinists | 10 | 27 |
| | | 514011 | Computer Machine Operators | 5 | 10 |
| | Transportation and Material Moving | 472073 | Operating Engineers | 50 | 103 |
| | | 474051 | Highway Maintenance Workers | 8 | 34 |
| | | 532012 | Commercial Pilots | 7 | 16 |
| Health Professions | Health Science, Other | 211014 | Mental Health Counselors | 26 | 53 |
| | | 119111 | Medical & Health Services Mgrs | 22 | 53 |
| | | 211011 | Substance Abuse/Behavior Disorder Counselors | 14 | 26 |
| | HIT and Medical Coding | 319092 | Medical Assistants | 21 | 46 |
| | | 292071 | Medical Records & HIT | 18 | 40 |
| | | 319094 | Medical Transcriptionists | 4 | 12 |
| | Health Care Office Mgmt | 119111 | Medical & Health Services Mgrs | 22 | 53 |

*Source: MTDLI 2015-2025 occupational employment projections. SOC to CIP crosswalk, U.S. Dept. of Education and U.S. Dept. of Labor Occupational titles are abbreviated. U.S. DOL provides official information about each SOC code. *= postsecondary. NA = Not Available.*

## FIGURE A.10 (CONTINUED)

## TOP OCCUPATIONAL EMPLOYMENT PROJECTIONS FOR COLLEGE PROGRAMS

| Program Category | Program | SOC | Occupation | MT Growth Openings | MT Total Openings |
|---|---|---|---|---|---|
| Health Professions (Continued) | Medical Admin Assistant | 436013 | Medical Secretaries | 32 | 52 |
| | | 319092 | Medical Assistants | 21 | 46 |
| | Allied Health Diagnostic, Intervention, Treatment | 292034 | Radiologic Technologists | 10 | 25 |
| | | 292041 | EMTs & Paramedics | 14 | 24 |
| | | 299091 | Athletic Trainers | NA | 18 |
| | Respiratory Care | 291126 | Respiratory Therapists | 8 | 17 |
| | | 251071 | Health Specialties Teachers* | 3 | 6 |
| | Surgical Technology | 292055 | Surgical Technologists | 9 | 14 |
| | | 251071 | Health Specialties Teachers* | 3 | 6 |
| | Physician Assistant | 291071 | Physician Assistants | 12 | 23 |
| | | 251071 | Health Specialties Teachers* | 3 | 6 |
| | Health Tech/ Assistant | 311014 | Nursing Assistants | 111 | 256 |
| | | 319091 | Dental Assistants | 11 | 41 |
| | | 292052 | Pharmacy Technicians | 19 | 31 |
| | Pharmacy | 291051 | Pharmacists | 10 | 36 |
| | | 251071 | Health Specialties Teachers* | 3 | 6 |
| | Physical Therapy | 291123 | Physical Therapists | 32 | 62 |
| | | 251071 | Health Specialties Teachers* | 3 | 6 |
| | Registered Nursing | 291141 | Registered Nurses | 209 | 445 |
| | | 291170 | Nurse Practitioners | 16 | 27 |
| | | 251072 | Nursing Instructors & Teachers* | 4 | 9 |
| | Practical Nursing | 292061 | LPN & Licensed Vocational Nurses | 32 | 107 |
| Business | Business | 111021 | General & Operations Mgrs | 60 | 177 |
| | | 119199 | Managers, All Other | 7 | 58 |
| | | 131051 | Cost Estimators | 22 | 55 |
| | Accounting | 132011 | Accountants & Auditors | 69 | 157 |
| | | 132041 | Credit Analysts | 1 | 5 |
| | | 132081 | Tax Examiners & Collectors | 1 | 5 |
| | Accounting Technology | 433031 | Bookkeeping & Auditing Clerks | NA | 93 |
| | | 433051 | Payroll & Timekeeping Clerks | 2 | 17 |
| | | 132082 | Tax Preparers | 3 | 11 |
| | Administrative Assistant | 434051 | Customer Service Reps | 89 | 221 |
| | | 436014 | Secretaries & Admin Assistants | 55 | 145 |
| | | 434171 | Receptionists & Information Clerks | 32 | 112 |
| | Finance | 111021 | General & Operations Managers | 60 | 177 |
| | | 132052 | Personal Financial Advisors | 7 | 50 |
| | | 132072 | Loan Officers | 19 | 41 |
| | Marketing | 131161 | Market Research Analysts | 16 | 25 |
| | | 112011 | Advertising & Promotions Mgrs | NA | 25 |
| | | 112022 | Sales Managers | 1 | 21 |

*Source: MTDLI 2015-2025 occupational employment projections. SOC to CIP crosswalk, U.S. Dept. of Education and U.S. Dept. of Labor Occupational titles are abbreviated. U.S. DOL provides official information about each SOC code. *= postsecondary. NA = Not Available.*

## A.2.3 Calculation of Supply by Occupation and Demand by Program

The supply of graduates by occupation is calculated as the sum of graduates from all programs that are connected to the occupation. The graduates are counted once in each occupation their program serves. Graduates can be counted multiple times across different occupations. However, an individual can only choose one occupation upon graduation, and then they are no longer available for the other occupations except as a potential future worker. As a result, the actual supply of students for each occupation may be less than what is estimated in this report. This concern is mitigated by focusing the analysis on high-wage, high-demand occupations because we can assume students will pursue careers that are most profitable.

The demand for graduates from each program of study is calculated as the sum of the projected job openings for each occupation a student graduating from the program is qualified to fill. In cases where multiple programs can prepare students for the same occupation, the demand for that occupation is counted once under each program it is associated with. The total demand for college programs does not equal the sum of the demand for each program because occupations linking to more than one program will be counted more than once.

## A.2.4 Determination of Supply and Demand Analysis Categories

For any occupation or program, Montana colleges are categorized as meeting demand if the average supply of graduates over the last three academic years falls within a range. The lower bound is the sum of growth openings and 53% of replacement openings. The upper bound of demand is equal to total openings, which is the sum of growth and replacements. Growth openings occur because of an increase in demand for an occupation. Replacement openings occur because as individuals retire or otherwise leave their jobs.

Although all of the estimated job openings will need to be filled, not all of the workforce supply will need to come from Montana colleges. As the state's labor market continues to tighten, natural market forces will help attract some new workers to the state. Increased in-migration will help offset some of the workforce shortages. In addition, job-to-job movements are included in the estimates of replacement openings and not all of those workers will need to be retrained before switching careers. Because of job-to-job turnover and in-migration, Montana colleges are not expected to fill all of the projected job openings. Using the labor force projection published by the MTDLI, it was determined that in-migration and job turnover may help fill as much as 47% of the state's workforce that is expected to retire or otherwise leave the jobs over the next ten years. The remaining 53% will most likely need to be filled by the state's post-secondary training system. Thus, the lower-bound of program and occupational demand was set as the sum of growth openings and 53% of replacement openings.

# APPENDIX B:

# DETAILED SUPPLY AND DEMAND BY PROGRAM

Figure B1 provides detailed information on the supply and demand analysis by program. The figure identifies the average annual supply of graduates from these programs over the last three academic years. Estimated demand for each program is presented as a range, where the lower bound is the sum of projected opening due to growth and retirements, and the upper bound is total projected annual job openings. Total openings includes openings due to job-to-job moves, as well as growth and retirement openings. Lastly, Figure B1 shows the percentage of demand that is stemming from occupations typically requiring a postsecondary education.

The GAP column is color-coded based on the results from the supply and demand analysis. If supply is less than total growth openings, then the program is categorized as undersupplied and is colored blue. If supply is between the lower bound and total openings, then the programs meets estimated demand and is colored green. If supply exceeds total openings, then the program is categories as oversupplied and is colored red.

## FIGURE B1

## SUPPLY AND DEMAND BY PROGRAM

| Program Category | Program | GAP | Lower Bound | Total Openings | College Supply | Percent of Demand Requiring Higher Ed |
|---|---|---|---|---|---|---|
| Agriculture and Natural Resource | Agriculture | Under | 293 | 157 | 95 | 20% |
| | Animal Science | Under | 176 | 81 | 45 | 1% |
| | Plant Science | Under | 213 | 105 | 29 | 19% |
| | Natural Resource Conservation & Management | Over | 53 | 32 | 96 | 100% |
| | Environmental Science | Over | 22 | 15 | 103 | 100% |
| | Forestry | Meets | 53 | 32 | 43 | 100% |
| | Fish and Wildlife Management | Over | 44 | 29 | 93 | 100% |
| Architecture | Architecture | Over | 33 | 24 | 43 | 100% |
| | Environmental Design/Architecture | Over | 35 | 26 | 46 | 100% |

*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC. Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years. Lower bound is the sum of growth openings and 53% of replacement openings.*

## FIGURE B1 (CONTINUED)

## SUPPLY AND DEMAND BY PROGRAM

| Program Category | Program | GAP | Lower Bound | Total Openings | College Supply | Percent of Demand Requiring Higher Ed |
|---|---|---|---|---|---|---|
| Communication | Mass Communication | Under | 54 | 31 | 14 | 100% |
| | Communication Studies | Over | 36 | 22 | 96 | 91% |
| | Journalism | Over | 34 | 20 | 70 | 100% |
| | Public Relations | Under | 74 | 43 | 33 | 100% |
| Computer/ Info Science | Computer/Info Science, Other | Under | 364 | 276 | 104 | 100% |
| | Information Technology | Under | 123 | 97 | 45 | 100% |
| | Computer Science | Under | 211 | 160 | 80 | 100% |
| Culinary Arts and Recreation | Personal and Culinary Services | Under | 424 | 300 | 33 | 0% |
| | Parks & Recreation | Under | 235 | 156 | 32 | 100% |
| | Health and PE/Fitness, General | Over | 106 | 71 | 142 | 53% |
| | Kinesiology and Exercise Science | Over | 0 | 0 | 107 | 100% |
| Education | Education, General | Over | 8 | 5 | 189 | 100% |
| | Curriculum and Instruction | Over | 5 | 4 | 61 | 100% |
| | Education Administration | Over | 38 | 22 | 57 | 100% |
| | Special Education | Over | 38 | 22 | 43 | 100% |
| | School Counselor | Under | 96 | 59 | 56 | 100% |
| | Elementary Education | Over | 107 | 66 | 238 | 100% |
| | Early Childhood Education | Meets | 52 | 32 | 38 | 100% |
| | Secondary Education | Under | 546 | 337 | 267 | 91% |
| Engineering | Mechanical Engineering | Over | 98 | 70 | 114 | 100% |
| | Engineering, General | Meets | 94 | 70 | 83 | 100% |
| | Chemical Engineering | Over | 21 | 15 | 68 | 100% |
| | Civil Engineering | Over | 75 | 50 | 79 | 100% |
| | Electrical and Electronics Engineering | Over | 39 | 27 | 49 | 100% |
| | Environmental Engineering | Under | 40 | 29 | 24 | 100% |
| | Petroleum Engineering | Over | 35 | 24 | 69 | 100% |
| | Industrial Engineering | Under | 31 | 21 | 20 | 100% |
| | Geological/Geophysical/Mining Engineering | Over | 26 | 17 | 28 | 100% |

*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC. Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years. Lower bound is the sum of growth openings and 53% of replacement openings.*

## FIGURE B1 (CONT.)
## SUPPLY AND DEMAND BY PROGRAM

| Program Category | Program | GAP | Lower Bound | Total Openings | College Supply | Percent of Demand Requiring Higher Ed |
|---|---|---|---|---|---|---|
| Engineering Technologies | Engineering Technologies, Other | Over | 78 | 50 | 100 | 75% |
| | Mechanical Engineering Technology | Over | 1 | 1 | 33 | 100% |
| | Construction Engineering Technology | Under | 99 | 68 | 44 | 100% |
| | Drafting and Design Technology | Over | 18 | 13 | 28 | 100% |
| Liberal Arts | Foreign Languages and Literatures | Meets | 86 | 50 | 69 | 100% |
| | Linguistics | Over | 3 | 2 | 23 | 100% |
| | English | Over | 86 | 50 | 176 | 100% |
| | Writing | Over | 29 | 17 | 38 | 100% |
| | General Studies | Over | 5 | 4 | 865 | 100% |
| | Visual and Performing Arts | Over | 88 | 53 | 222 | 77% |
| | Cinematography and Film | Over | 22 | 15 | 117 | 100% |
| | Music | Over | 41 | 23 | 60 | 27% |
| | Philosophy/Theology | Over | 27 | 19 | 32 | 100% |
| | History | Over | 144 | 83 | 150 | 100% |
| Law | Law | Over | 77 | 56 | 86 | 100% |
| | Legal Support/Paralegal | Under | 63 | 44 | 12 | 59% |
| Physical Science | Physical Science, Other | Meets | 137 | 83 | 126 | 100% |
| | Biology, General | Over | 105 | 61 | 244 | 100% |
| | Microbiology | Over | 16 | 11 | 41 | 100% |
| | Mathematics/Stats | Over | 99 | 59 | 106 | 100% |
| | Chemistry | Under | 100 | 60 | 56 | 100% |
| | Geology | Over | 30 | 21 | 105 | 100% |
| | Physics | Under | 93 | 54 | 33 | 100% |
| Human Services | Public Safety | Under | 220 | 137 | 67 | 35% |
| | Human Services | Under | 77 | 54 | 16 | 46% |
| | Public Administration | Under | 310 | 201 | 42 | 97% |
| | Social Work | Under | 164 | 112 | 92 | 100% |

*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC. Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years. Lower bound is the sum of growth openings and 53% of replacement openings.*

## FIGURE B1 (CONT.)
## SUPPLY AND DEMAND BY PROGRAM

| Program Category | Program | GAP | Lower Bound | Total Openings | College Supply | Percent of Demand Requiring Higher Ed |
|---|---|---|---|---|---|---|
| Social Science | Social Science, General | Under | 154 | 91 | 79 | 100% |
| | Anthropology | Over | 60 | 35 | 119 | 100% |
| | Psychology | Over | 78 | 48 | 304 | 100% |
| | Economics | Meets | 65 | 38 | 53 | 100% |
| | Geography | Under | 59 | 34 | 30 | 100% |
| | Political Science | Over | 60 | 35 | 119 | 100% |
| | Sociology | Over | 59 | 35 | 159 | 100% |
| Construction, Mechanic and Transportation | Construction | Under | 791 | 621 | 66 | 0% |
| | Mechanic Repair Technology | Under | 62 | 47 | 22 | 81% |
| | Automotive Technology | Under | 156 | 101 | 35 | 79% |
| | Diesel Technology | Over | 52 | 40 | 73 | 0% |
| | Metal Technology | Over | 104 | 69 | 161 | 0% |
| | Transportation and Material Moving | Under | 207 | 147 | 63 | 1% |
| Health Professions | Health Science, Other | Over | 199 | 148 | 279 | 96% |
| | HIT and Medical Coding | Under | 98 | 72 | 68 | 100% |
| | Health Care Office Management | Over | 53 | 38 | 56 | 100% |
| | Medical Admin Assistant | Under | 99 | 77 | 70 | 47% |
| | Allied Health Diagnostic, Intervention, Treatment | Over | 74 | 52 | 92 | 100% |
| | Respiratory Care | Meets | 24 | 18 | 18 | 100% |
| | Surgical Technology | Over | 20 | 16 | 29 | 100% |
| | Physician Assistant | Over | 29 | 23 | 30 | 100% |
| | Health Tech/ Assistant | Under | 420 | 308 | 99 | 93% |
| | Pharmacy | Over | 42 | 28 | 66 | 100% |
| | Physical Therapy | Over | 68 | 52 | 81 | 100% |
| | Registered Nursing | Over | 481 | 363 | 535 | 100% |
| | Practical Nursing | Over | 107 | 71 | 144 | 100% |

*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC. Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years. Lower bound is the sum of growth openings and 53% of replacement openings.*

## FIGURE B1 (CONT.)
## SUPPLY AND DEMAND BY PROGRAM

| Program Category | Program | GAP | Lower Bound | Total Openings | College Supply | Percent of Demand Requiring Higher Ed |
|---|---|---|---|---|---|---|
| Business | Business | Over | 642 | 426 | 767 | 93% |
| | Accounting | Meets | 181 | 130 | 166 | 100% |
| | Accounting Technology | Meets | 125 | 67 | 104 | 75% |
| | Administrative Assistant | Under | 497 | 347 | 44 | 0% |
| | Finance | Under | 344 | 229 | 44 | 100% |
| | Marketing | Over | 82 | 52 | 109 | 100% |

*Source: MTDLI 2015-2025 occupational employment projections. Graduate data from OCHE, CC, and RMC. Demand is sum of all occupations a graduate from the program could fill. Supply is average over last three academic years. Lower bound is the sum of growth openings and 53% of replacement openings.*

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