

# P-20 Education Report: An Employer Perspective:



Where Does Missouri's Workforce Come From?

## Acknowledgements



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# Executive Summary

Where do Missouri public high school graduates attend college in the state and how many leave or attend private colleges? What industries do Missouri's public college graduates enter, and what are their average earnings by program of study, degree level, and industry? What are the trends for employment and earnings of public high school students that drop out and those that graduate and do not attend college? This report summarizes Missouri's first analysis using linked unit record data from the Departments of Elementary and Secondary Education, Higher Education, and Economic Development. In addition, this report summarizes Missouri's first attempts to conduct inquiries using linked data, the results from which provide preliminary insights about the trends and characteristics of students in Missouri as they transition from the K-12, college, and workforce systems.

The findings presented in this report should be viewed as evidence of the valuable research made possible through the use of linked data systems, but caution must be exercised in the use of specific facts and figures as a basis for decision-making. Further work refining existing data systems and linkages is necessary to establish a truly robust and reliable data network for such purposes.

Based on the records that could be linked, highlights of the research findings include:

- Low-income students in Missouri that completed an ACT assessment were less likely to enroll in higher education compared to Missouri students with higher family income levels. Only 22.4% of Missouri 2008 high school exiters who completed an ACT assessment who were eligible for free or reduced price lunch enrolled in higher education in 2008-09.
- A+ eligibility contributed to greatly increased chances for college attendance for populations that normally would be less likely to attend. Although 24.8% high school graduates that completed an ACT assessment completed requirements for A+ eligibility, they made up 47.0% of students enrolling in college.
- Missouri high school students in the linked records that completed an ACT assessment who completed a college preparatory certificate were significantly less likely to enroll in remedial college courses the following fall. For 2008-09 Missouri higher education institutions, only 7.9% of all enrollees in remedial classes had completed the high school college preparatory certification the previous spring.
- Only 2% of Missouri high school graduates students in the linked records that completed an ACT assessment enrolled in higher education and were determined by ACT to be college ready (as defined by having an ACT Math sub score of 21 or greater) were enrolled in remedial math coursework compared to 38% of those below a 21, and 48% of those without an ACT score.
- For Missouri 2008 high school exiters that did not enroll in Missouri public colleges the following fall, students that graduated earn on average \$123 more than those students that drop out of high school. The top three industries that Missouri high school dropouts work in are: Accommodation and Food Services, Retail Trade, or Administrative Support and Waste Management.
- For Missouri graduates of 4-year public institutions, those that graduated with STEM-related degree enjoyed higher wages in the fall following graduation than many of their counterparts with non-STEM-related degrees.
- Male college graduates earned more than their female counterparts after graduation in 17 out of 20 industry sectors. The gender wage disparity for college graduates was largest in Manufacturing, Information Services, and Professional, Scientific, & Technical Services.
- Of the most popular Bachelor's degree programs (by highest number of graduates) 17 out of 20 subject areas were the same for both male and female completers, with Business Management the most popular for both genders. However, in only 8 of the 26 different types of Bachelor's degrees did female graduates earn more than their male counterparts after graduation.

## Overview

### The Case for Change

In today's increasingly competitive global economy, significant benefits accrue to states and regions who build an education advantage to complement other economic and community assets. Missouri is currently competing with other states, and other countries, to position itself as having a world-class education system that adequately prepares Missouri students, the emerging workforce, for family-supporting career opportunities that await them in the New Economy.

With math and science being the new global language for economic competitiveness, Missouri is positioned to enhance its ability to create high-tech innovations that drive high-wage jobs and improve the quality of life for all Missourians. Math and science core competencies are the cornerstone of the high-tech, innovation economy. The P-20 Council has worked in recent years toward improving the performance of all Missouri students, expanding the pool of students motivated to pursue STEM careers, and highlighting the importance of STEM-related industries and jobs in enhancing Missouri's global competitiveness and innovation. These priorities have the potential to be even more fruitful if Missouri can develop an even more coherent system of P-20 education where each level of education -- preschool, elementary, middle school, high school and college -- prepare students well for the next level.

In 2009, Governor Nixon signed into law an expanded Missouri P-20 Council. The Council consists of: the Missouri Department of Elementary and Secondary Education; the Missouri Department of Higher Education; the State Board of Education; the Coordinating Board for Higher Education; the Coordinating Board for Early Education; and unlike most states, the Missouri Department of Economic Development, the agency with primary responsibility for meeting the needs of business and industry. The job of the Council is to provide better, stronger, more aligned education and workforce training systems. This alignment of systems and programs will better serve Missourians and make it easier for our state's students to receive the education they need to compete in the New Economy.

### The Goal of P-20 Research

In 2008, The National Governors Association awarded Missouri an Honor States Grant for P-20 Longitudinal Data Analysis to develop a pilot system to gather and share longitudinal data on students in the Missouri education pipeline. The pilot database project has linked graduation and workplace data in order to establish a baseline for aligning curriculum and workplace skills for workforce development. The data system is designed to provide better collaboration between Missouri state agencies and better informed decision-making at the statewide, regional, and local levels. This grant has allowed Missouri to take a significant step forward in its ability to answer critical research questions and to provide value-added education information that reports on student progress and success in education at all levels.

Missouri's long-term goal is to link and share data among the Missouri Department of Elementary and Secondary Education (DESE), Missouri Department of Higher Education (MDHE), and Department of Economic Development (DED) to establish benchmarks and tracking mechanisms to better assess how students are meeting critical benchmarks throughout the education continuum. Under this grant, the Missouri P-20 Interagency Workgroup gathered data on student course-taking and degree completion at the secondary and postsecondary levels and linked these data with employment data and workforce supply data in target industries. While this grant did not provide enough resources to develop a complete P-20 longitudinal data system, it has led toward improved data system capacity across DESE, MDHE, and DED.

The primary objective of this report was to supply feedback to the economic development, business, and workforce development communities about trends in the education and workplace pipeline. It was envisioned that statewide leaders would use the data and process from these reports to plan and act to improve the quality and relevance of education and training to ensure that Missourians have the right talent and fit for occupations in in-demand industries. While previous cross-agency analysis provides some intelligence to education stakeholders, it is not sufficient to drive a bold, innovative agenda to re-imagine the way Missouri prepares students for the challenges in the New Economy.

# Methodology

## Datasets Used

Data from DESE included two Missouri Student Information System (MOSIS) data files, 2008 June Cycle Student Core and 2008 June Enrollment and Attendance Student Core files. The June Cycle Student Core and the June Enrollment and Attendance files were merged by the Department prior to matching. The MOSIS State ID was used by DESE to merge the Student Core file with the Enrollment and Attendance file prior to matching. Identification information included in the data included for matching was student's name, social security number, State ID, Local ID, and date of birth.

Data from MDHE included the Enhanced Missouri Student Achievement Study (EMSAS), Free Application for Federal Student Aid (FAFSA), Grants, ACT assessment, and A+ data files. Records from the 2005-06 academic year through the 2008 Fall enrollment were included from January through June in 2009.

Data from the DED - Missouri Economic Research and Information Center (MERIC) included Unemployment Insurance (UI) wage records datasets. The wage records were shared per the terms of a Memoranda of Understanding with the Missouri Department of Labor and Industrial Relations (DOLIR) for the sharing of Unemployment Insurance wage and employment data with third parties. Unemployment Insurance wage files were included for seven quarters; first quarter 2007 to the third quarter of 2008.

The University of Missouri - Office of Social and Economic Data Analysis (OSED) was the recipient of data sets from the departments of Elementary Secondary Education, Higher Education, and Economic Development.

Data from the National Student Clearinghouse (NSC) was also used to provide additional context and information than would be available using only the datasets described above. NSC provides follow-up information on individuals by searching for student attendance and graduation records across a nationwide cross-section of postsecondary institutions. In total, three data requests were submitted to NSC—(1) a list of 2006-07 graduates of Missouri public college; (2) a list of students who attended Missouri public colleges in 2007-08 but who were not found in that year's graduation records or the following year's enrollment records; and (3) a list of students who had exited the Missouri public high school system by June 2008. Each of these lists were constructed through simple random sampling of the respective student populations having valid social security numbers.

## Common ID

A "NatID" was added to each record creating a secure common ID across files. The de-identification process protects the privacy of individuals whose records are included in the files sent to OSED. However, the creation of the NatID is dependent upon a record having a valid social security number and clearly not all records in dataset to be linked have social security numbers or valid social security numbers. Only 60% of the records in the ACT file contained valid social security numbers. The linked MOSIS, ACT, and EMSAS Enrollment file had 20,987 records of which 45% had valid social security numbers.

DESE has implemented a unique identifier for all students enrolled in Missouri's public elementary and secondary schools. The unique identifier has the potential to be used at the post-secondary level, following a student into a postsecondary institution. Additional record links should occur if a MOSIS ID is used to link secondary and post secondary records and thus obtaining additional social security numbers by linking to other files such as Free Application for Federal Student Aid (FAFSA).

Probabilistic matching using variables such as name, date of birth, gender, and race/ethnicity also might be a technique that could increase the percentage of records that could be linked. The intent is to increase the number of linked records that can be used for longitudinal analysis, which in theory should add to the reliability of each study's conclusions. Such increases in the number of linked records may or may not add information or change the populations studied. However, the results/conclusions could be compared (with and without the probabilistically matched records) and thus future decisions regarding the use of this type of technique could be evaluated.

## Linked Data

### *DESE Datasets*

The June 2008 MOSIS Student Core file was filtered to only include students with social security numbers and only those records with the most recent exit date for each student as matched by MOSIS ID. The June 2008 MOSIS Enrollment and Attendance was filtered by Exit Date and only those records with the most recent exit date for each student as matched by MOSIS ID.

### *MDHE Datasets*

No filters were applied to the ACT, Grants, or A+ files for matching. The EMSAS Completion File 1 was filtered by social security number, calendar year and academic term for Summer 2007; Fall 2007; Winter 2008; or Spring 2008. The EMSAS Completion File 2 was filtered by calendar year and academic term for Summer 2007; Fall 2007; Winter 2008; or Spring 2008. The EMSAS Enrollment File 1 was filtered by social security number and for the 2008 calendar year. The EMSAS Enrollment File 2 was filtered for the 2008 calendar year. The EMSAS Term Registration File was filtered by social security number, the most recent academic term, and calendar year for Summer 2007; Fall 2007; Winter 2008; or Spring 2008.

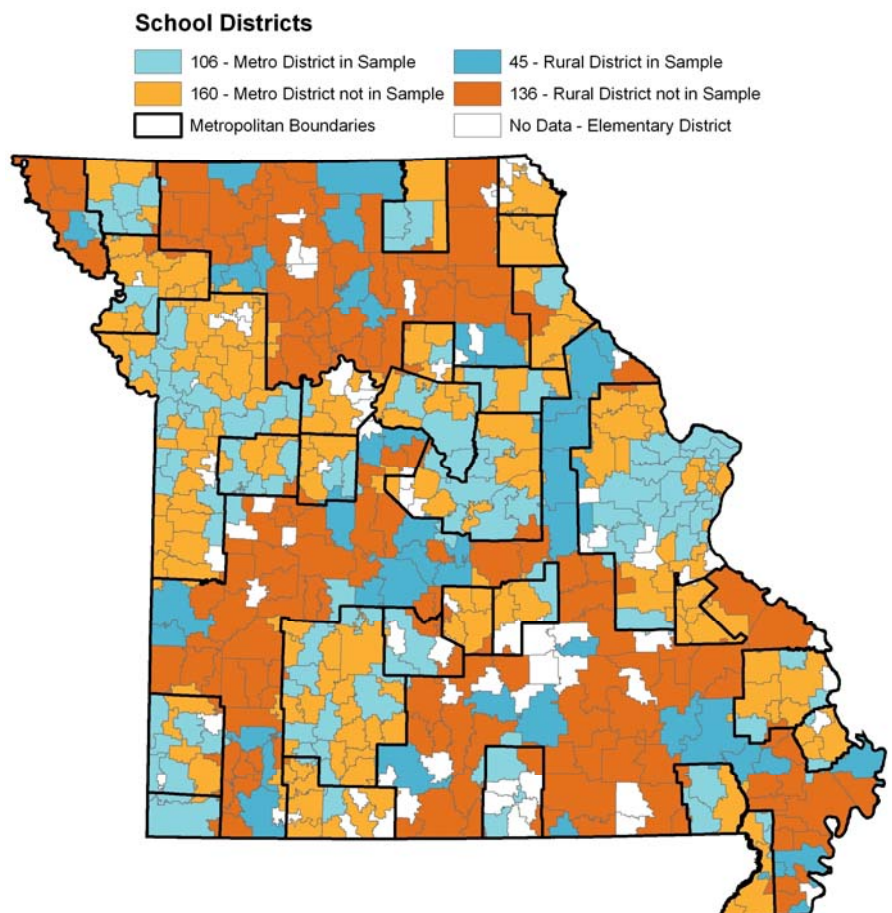
### *DED Datasets*

Only wage records with valid social security numbers were selected for analysis. Unemployment Insurance (UI) Wage records were then aggregated by quarter and social security number by selecting the highest wage record for individuals with multiple wage records in a single quarter.

### *Representativeness of Linked Datasets*

Five linked datasets were created by linking MOSIS records with EMSAS records, EMSAS with UI records, EMSAS with UI, and linking three EMSAS files. Of the 34,320 records from the MOSIS file, 34.9% were linked to the EMSAS Enrollment file and 28.0% were linked to an EMSAS and ACT file. For the MOSIS to UI wage records, 70% of the 34,320 MOSIS records were linked between the two files. Of the 34,214 records from the EMSAS Completers file, 100.0% were linked to the UI wage records.

When interpreting the analysis of the linked records in the report, it is important to note the representativeness of the MOSIS records with respect to how many school districts were not included in the analysis. Of the 447 school districts with high school exiter data, 296 school districts (160 metropolitan and 136 rural) were not included in the analysis due to not having a valid SSN in the MOSIS student core file. Although there are alternative methods of matching administrative records, this initial research focused on the analysis that could be conducted with matching on social security number alone. In the future, researchers can plan/discuss the future use of the MOSIS Identifier linked to social security numbers to create a more representative sample of school districts across the state.



## High School Graduates- College Enrollment

Researchers linked information on high school exiters of public Missouri high schools with enrollment data from Missouri public higher education institutions and ACT assessment records. Students who were not located in the data matching process may have enrolled at private higher education institutions or out-of-state or not have completed an ACT assessment.

### Demographic Trends

Breakouts in enrollment data by gender show that a slightly larger share of Missouri female graduates in the linked records who completed an ACT assessment (38.8%) attended college compared to their male counterparts (32.8%). While females constituted only 51.0% of Missouri's 12<sup>th</sup> grade graduate population, they represented 55.1% of the total number of students enrolling in Missouri's colleges.

Public Postsecondary Enrollment by Gender		
Enrollment by Gender	Count	% of Total
Female	5,312	55.1%
Male	4,330	44.9%
Unknown	5	0.1%
<b>Grand Total</b>	<b>9,647</b>	<b>100.0%</b>

College enrollment data broken out by race/ethnicity show that, compared to all other groups, African American Missouri graduates in the linked records who completed an ACT assessment were less likely to go on to attend college. Only 20.8% of these African American high school graduates enrolled in Missouri colleges the following fall, a significantly smaller share compared to their Hispanic (34.6%), Caucasian (36.4%), and Asian (36.9%) classmates.

Public Postsecondary Enrollment by Race/Ethnicity		
Enrollment by Race/Ethnicity	Count	% of Total
African American	693	7.2%
American Indian / Alaskan Native	58	0.6%
Caucasian	8,160	84.6%
Hispanic	205	2.1%
Asian / Pacific Islander	153	1.6%
Non-Resident Alien	20	0.2%
Other	53	0.5%
Unknown	305	3.2%
<b>Grand Total</b>	<b>9,647</b>	<b>100.0%</b>

### K-12 Exit Trends

Missouri high school graduate records that were matched with Missouri college enrollment data and ACT assessment records were also broken out by type of exit in the High School system. Not surprisingly, the majority of Missouri students enrolling in college in the fall following graduation were high school graduates. The linked records show that Missouri high school students that graduated without a college preparatory certificate constituted a majority of Missouri high school graduates enrolling in college.

Postsecondary Enrollment by Secondary System Exit Type		
Exit Type	Count	% of Total
Drop Out	9	0.1%
Graduated - No College Prep Cert	6,064	62.9%
Graduated - College Prep Cert	3,574	37.0%
<b>Total</b>	<b>9,647</b>	<b>100.0%</b>

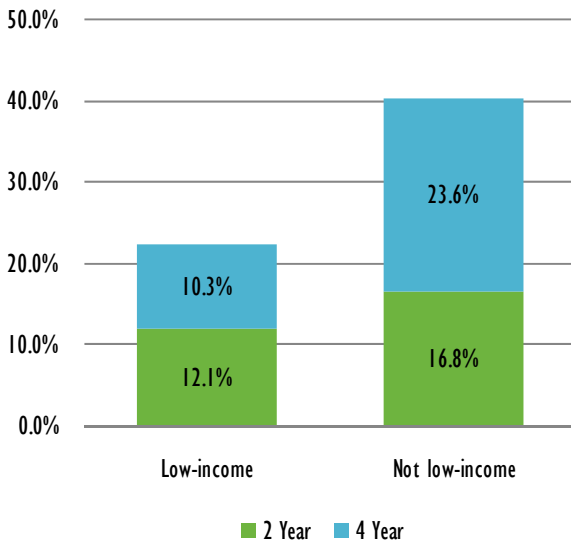
### Missouri College Preparatory Studies Certificate

The Missouri State Board of Education awards the College Preparatory Studies Certificate (CPSC) to Missouri students who successfully complete a rigorous academic program in high school. The certificate is awarded in addition to the regular high school diploma granted by local school districts. Created in 1985, the certificate is designed to provide incentive and recognition for public and non-public high school students who exceed the state's minimum graduation requirements. In 1994, the State Board of Education revised its requirements for the CPSC in order to align with the "Core Curriculum" standards recommended by the Coordinating Board for Higher Education as a basis for college admissions in Missouri. Awarding the College Preparatory Studies Certificate is voluntary on the part of school districts, and meeting the requirements is voluntary on the part of the students. While the certificate is primarily intended as an incentive for college-bound students, those who are not planning to enter college also may wish to work toward earning the award. School officials are encouraged to use the program to encourage ALL students to pursue excellence in their high school studies.

For more information, visit [www.dese.mo.gov](http://www.dese.mo.gov).



### Higher Education Enrollment (2008-09) of 2008 Missouri High School Graduates



### Core Curriculum Participation

For the purposes of this report researchers defined low-income as a combination of either free or reduced lunch status. Researchers often use free or reduced price lunch (FRPL) enrollment figures as a proxy for poverty at the school level. Accordingly, annual free/reduced lunch data is regularly used within school districts to determine a school's eligibility for Title I funds. It is also used as a proxy for low-income status when determining whether a subgroup of needy students is making Adequate Yearly Progress (AYP) under No Child Left Behind.

Additional breakouts were created to investigate the impact of high school student participation in the Missouri Core Curriculum standards on enrollment in Missouri colleges. To date, MDHE has not required 2-year colleges to report student information about Core Curriculum participation, which accounts for the large percentage of students with "unknown" Core Curriculum status (42.7%).

### Missouri Core Curriculum

The Coordinating Board for Higher Education (CBHE) High School Core Curriculum policy guidelines were aligned in 2006 with the new graduation requirements adopted by the State Board of Education. The High School Core Curriculum policy guidelines are designed to ensure consistent messages to high school students about the importance of preparation for collegiate-level work and alignment with State Board of Education graduation requirements. The CBHE 24-unit high school core curriculum has been recommended for full implementation beginning with the Missouri high school graduating class of 2010.

For more information, visit [www.dhe.mo.gov](http://www.dhe.mo.gov)

### Socioeconomic Trends

Linked data demonstrated that low-income students who completed an ACT assessment in Missouri were less likely to enroll in higher education compared to Missouri students with higher family income levels. Analysis of matched student records shows that 22.4% of Missouri 2008 high school exiters who completed an ACT assessment who were eligible for free or reduced price lunch enrolled in higher education in 2008-09, compared to 40.4% of Missouri students who were not eligible for free/reduced lunches.

### National School Lunch Program

The National School Lunch Program is a federally assisted meal program operating in public and nonprofit private schools and residential child care institutions. It provides nutritionally balanced, low-cost or free lunches to children each school day. The program was established under the National School Lunch Act, signed by President Harry Truman in 1946.

Children from households with incomes less than 130% of poverty are eligible for free lunches; those from households below 185% of poverty are eligible for reduced-price lunches.

For more information, visit <http://www.fns.usda.gov/cnd/Lunch/>

Public Postsecondary Enrollment by Core Curriculum Indicator		
Enrollment by Core Curriculum Indicator	Count	% of Total
<b>2 Year Institutions</b>		
No	28	0.3%
Unknown/NA	4,121	42.7%
Yes	47	0.5%
<b>4 Year Institutions</b>		
Equivalent	256	2.7%
No	145	1.5%
In Spirit	187	1.9%
Unknown/NA	177	1.8%
Yes	4,686	48.6%
<b>Total</b>	<b>9,647</b>	<b>100.0%</b>

### A+ Program Eligibility

Matched record analysis showed that A+ eligible high school graduates were over-represented among those who provided a valid social security number in the K-12 student record system. This overrepresentation of A+ students with valid social security numbers was likely due to the fact that colleges in Missouri have historically needed valid social security numbers to request A+ payments from the K-12 system as part of the A+ program.

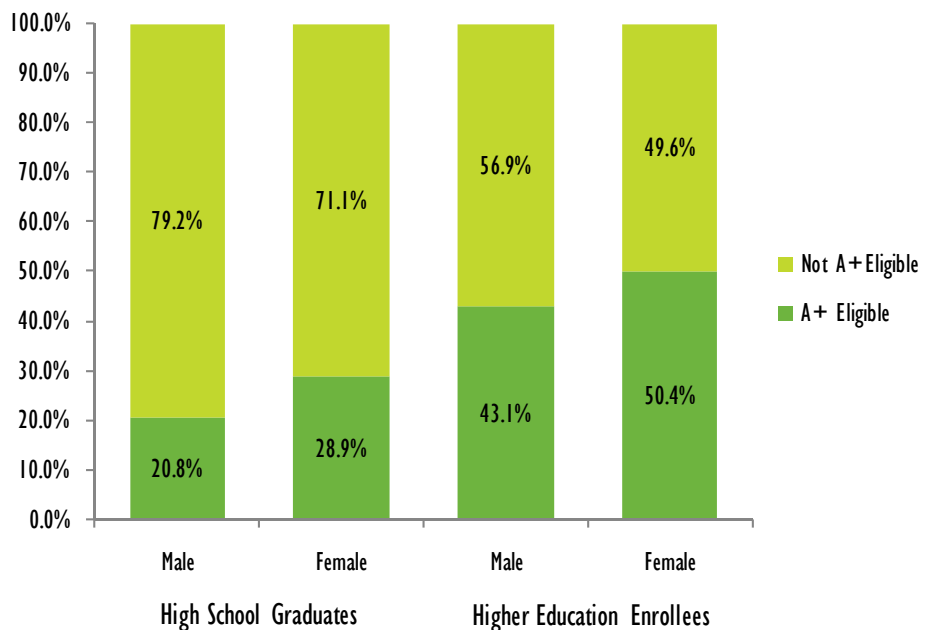
Breakouts of matched data by gender showed that although 28.9% of female and 20.8% of male high school graduates in the linked records who had completed an ACT assessment had completed requirements for A+ eligibility, they made up 50.4% of the female and 43.1% of the male students in the linked records enrolling in college in the fall of 2008.

Additional breakouts by race/ethnicity showed that 30.1% of Caucasian exiters who had completed an ACT assessment in the linked records had completed eligibility requirements, compared to 11.3% of Hispanics and 7.6% of African-American students. In fall 2008 higher education enrollment records, 48.8% of enrolled Caucasian students in the linked records were A+ eligible, compared to 45.5% of Hispanics and 30.2% of African-American students.

Breakouts by income status show that while 17.8% of A+ eligible high school graduates who had completed an ACT assessment in the linked records in Missouri were enrolled for free or reduced lunch they constituted 16% of those enrolling for college in the fall, an enrollment trend vastly different than that for low income students overall.

The data suggest that A+ eligibility contributed to greatly increased changes for college attendance for populations that normally would be less likely to attend.

**Missouri High School Graduation and Higher Education Enrollment (2008-09)  
by A+ Eligibility by Gender**



### Missouri A+ Schools Program

The A+ Schools Program was created in 1993 by Missouri state law as an incentive for improving Missouri's high schools. The primary goal of the A+ Schools Program is to ensure that all students who graduate from Missouri high schools are well prepared to pursue advanced education and/or employment.

Once a high school successfully meets the program requirements, it is formally designated by the State Board of Education. To date, the Board has designated 274 public high schools as A+ schools.

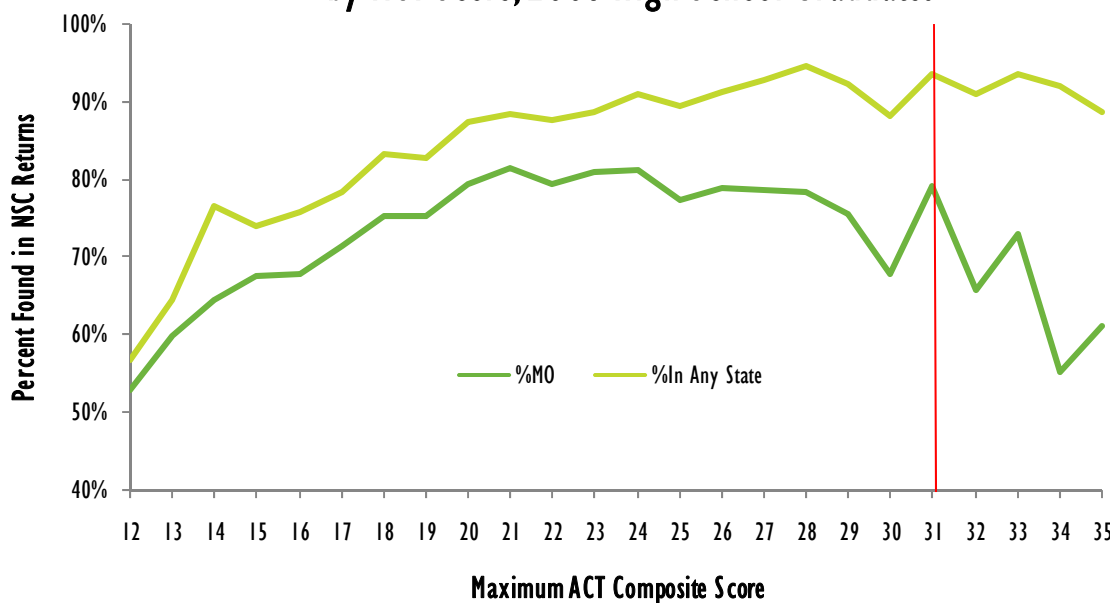
Students who graduate from a designated A+ high school may qualify for a state-paid financial incentive to attend any public community college or career/technical school in Missouri if the students successfully meet the following requirements: (1) enter into a written agreement with the high school prior to graduation, (2) attend a designated school for three consecutive years immediately prior to graduation, (3) graduate with an overall GPA of 2.5 points or higher on a 4-point scale, (4) have an overall attendance rate of at least 95 percent for grades 9-12, (5) perform 50 hours of district-supervised, unpaid tutoring or mentoring, (6) maintain a record of good citizenship and avoid the use of drugs and alcohol.

For more information, visit [www.dese.mo.gov](http://www.dese.mo.gov)

### Out-of-State and Private Institution Trends

Missouri's Bright Flight scholarship is designed to combat so-called "brain drain"—the siphoning of gifted students to out-of-state colleges. Researchers analyzed data on 2008 Missouri high school graduates that were linked with data from the National Student Clearinghouse (NSC) to examine patterns of college-going behavior in students whose behavior may have potentially been affected by the scholarship. In 2008-09, Bright Flight was available to high school graduates scoring a 31 or better on the ACT. For this analysis In-State / Out-of-State status was based on the characteristics of the first college student that attended following high school graduation.

## Likelihood of Any Missouri College Attendance by ACT Score, 2008 High School Graduates



The analysis has revealed evidence that the Missouri Bright Flight program encouraged enrollment at Missouri postsecondary institutions among those who just met the eligibility threshold as suggested by the spike in Missouri college attendance in the above graphic. For high school graduates with even greater aptitude (ACT scores of 33 or above), the picture was less clear. Researchers speculated that this may be partially due to inadequate sample size at increasing aptitude levels, and partially due to constraints on the ability to represent a broad cross-section of Missouri high school graduates in the study sample.

To the right are the top states for college enrollment among Missouri high school graduates scoring a 28 or better on the ACT; there were 1,129 students scoring at that level. The 'Not Found' entry in the list denotes students not enrolled in an NSC-participating postsecondary school immediately following high school graduation.

### Place of College Attendance for Missouri 2008 High School Graduates, ACT Score of 28 or Higher

State	Percent
Missouri	73.5%
Not Found	7.5%
Illinois	2.6%
Kansas	2.2%
Arkansas	1.7%
Iowa	1.5%
Indiana	1.2%
California	1.0%
Texas	0.9%
Tennessee	0.7%

# High School Graduates- College Remediation

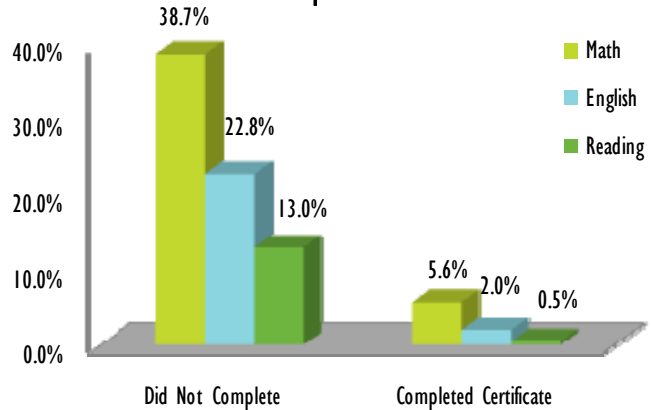
## College Preparatory Certificate Completion

Researchers also linked records for graduates of Missouri public high school students with enrollment data from Missouri higher education institutions and ACT assessment records to analyze trends in those enrolled in remedial college courses.

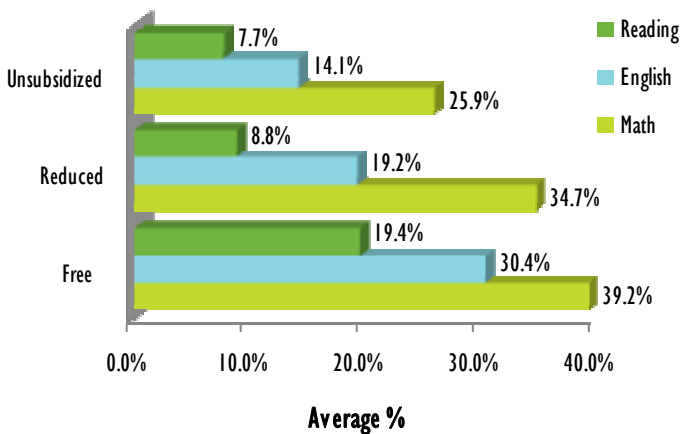
Missouri high school students who completed a college preparatory certificate and completed an ACT assessment were significantly less likely to enroll in remedial college courses the following fall. For 2008-09 Missouri higher education institutions, only 7.9% of all enrollees in remedial classes had completed the high school college preparatory certification the previous spring.

As the new MDHE core standards become mandatory for public Missouri higher education institutions, the remediation rate may decrease over time.

## Postsecondary Remediation by High School College Preparatory Certificate Completion



## Postsecondary Remediation by High School Lunch Status



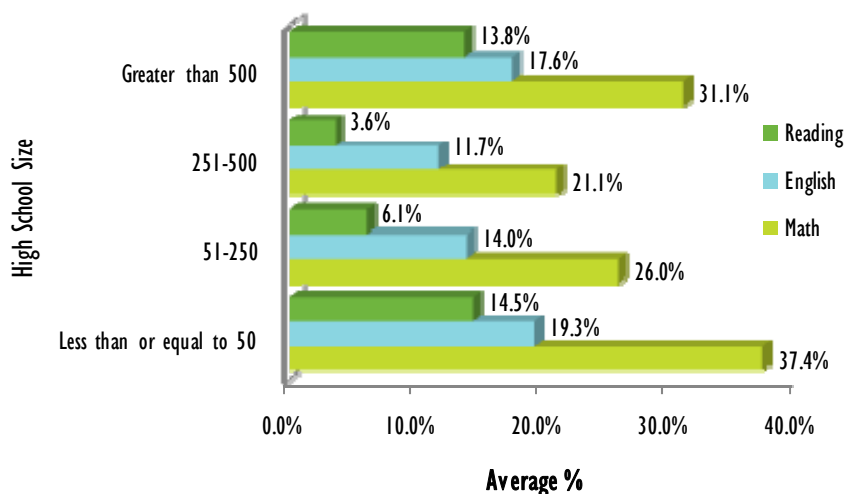
## Socioeconomic Trends

Differences in remedial higher education enrollment were found for Missouri high school students in the linked records receiving free or reduced lunches. For 2008 Missouri high school graduates that completed an ACT assessment and enrolled in Missouri colleges the following fall, 53.7% of students receiving free lunches were enrolled in remedial collegiate courses compared to 32.5% of students receiving full price lunches.

## High School Size

Additional analysis on college remediation trends was conducted with breakouts by size of high school. Matched data indicate that Missouri high school students who enrolled in Missouri public colleges and completed an ACT assessment were least likely to be enrolled in remedial courses if they attended a high school with a population between 251 and 500 students. The greatest likelihood of being enrolled in remedial collegiate courses was seen in matched records for students that attended the smallest and largest high schools by size in Missouri.

## Postsecondary Remediation by High School Size



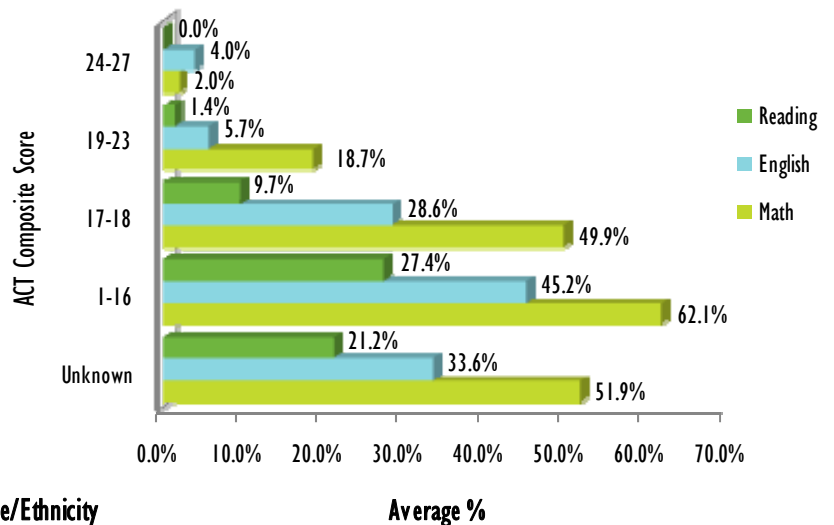
### ACT Test Scores

Only 2% of Missouri high school graduates in the linked records enrolled in higher education and were determined by ACT to be college ready (as defined by having an ACT Math sub score of 21 or greater) were enrolled in remedial math coursework compared to 38% of those below a 21, and 48% of those without an ACT score.

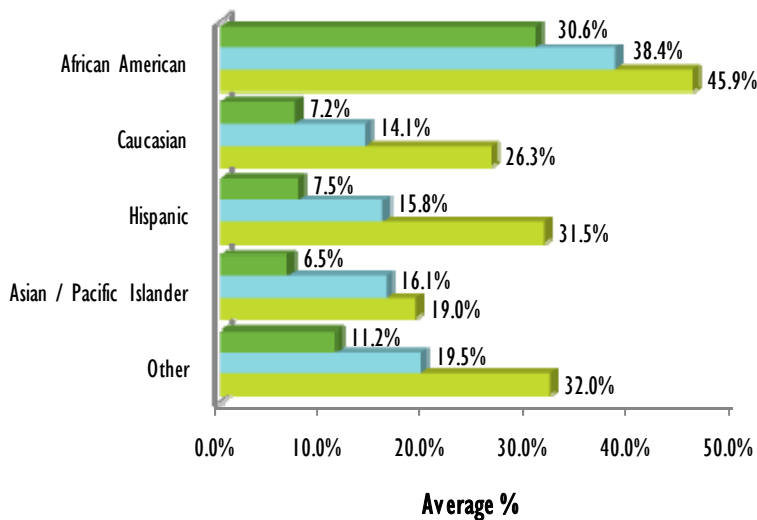
Unfortunately significant numbers of potentially non-prepared students were not enrolled. As many as 50% of Missouri students not enrolled in remedial education had ACT Math scores below the ACT benchmark. These numbers may be skewed since there is discrepancy across institutions as to which courses are considered “remedial”. While some include courses like “Intermediate Algebra”, others do not.

Similar to Math, only 5% of English ready and 1% of reading-ready ACT Missouri students were enrolled in remedial education in Missouri higher education institutions. Yet 30% of those not in English remediation and 43% not in reading were below the respective ACT benchmarks.

Postsecondary Remediation by ACT Composite Score



Public Postsecondary Remediation by Race/Ethnicity



Average %

### Demographic Trends

Breakouts of remediation data by race show that, an average total of 33.0% of Caucasians in the linked records that completed an ACT assessment were in remedial coursework in Missouri higher education institutions compared to 61.6% of African-Americans and 36.8% of Hispanics.

The matched data on postsecondary remediation disaggregated by gender did not show any significant gender differences in remedial placement for male (32.8%) and female (37.2%) Missouri high school graduates in the linked records.

### Defining Remedial Coursework in Missouri Higher Education Institutions

Remedial and developmental education courses are instructional courses designed for students who are deficient in the general competencies necessary for enrollment in a regular postsecondary curriculum and educational setting. Remedial and developmental courses are typically credit bearing, but do not usually meet general education requirements for a bachelor of arts, associate of arts or fulfilling the 42 credit hour transfer block course work. Missouri public higher education institutions each establish their own methods of determining student need for remediation. While most schools have established ACT cut scores in math, English and reading as a guideline for their institution, there are significant differences across institutions.

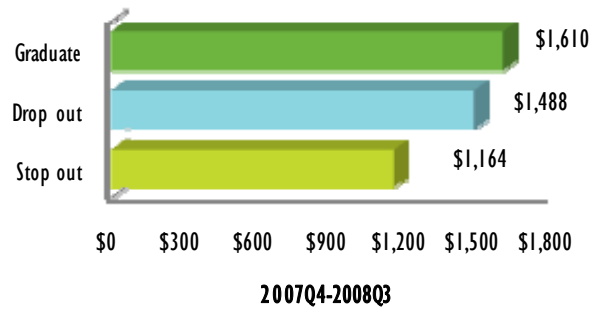
# High School Exiters Employment Trends

Missouri high school exiters with valid social security numbers were linked with employment and earnings data by industry sectors. For the purposes of this report, “employment” only includes individuals in the Missouri Unemployment Insurance wage record system. Individuals who were not located in the data matching process may have found employment in non-covered employment sectors (i.e. agriculture), be unemployed, not had valid social security numbers for linking, or have found employment out-of-state. Data was analyzed for high school exiters entering the workforce directly after high school for both college enrolled and non-enrolled students.

## Type of Exit

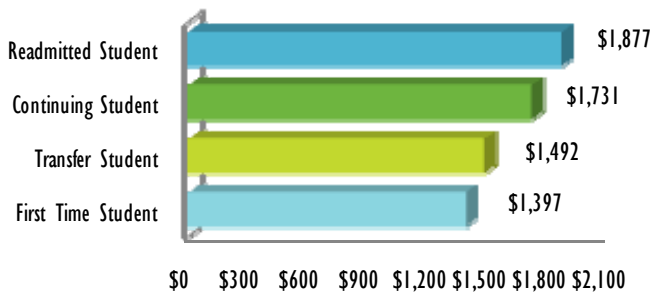
For Missouri 2008 high school exiters that did not enroll in Missouri public colleges the following fall, students that graduated earned on average \$123 more than those students that dropped out of high school.

## Average Wage for Non-College Enrolled High School Completers

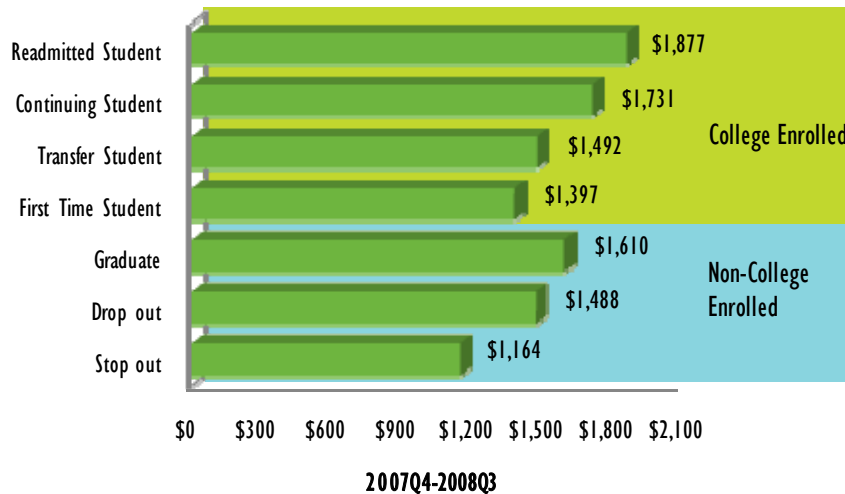


Breakouts in the matched high school exit and college enrollment data were created by type of enrollment for Missouri high school graduates. For Missouri 2008 high school graduates that enrolled in Missouri public institutions the following fall, first-time students earned the lowest average wages.

## Average Wage for High School Graduates by College Enrollment Status



## Average Wage for Missouri High School Graduates



## Missouri Unemployment Insurance Wage Records

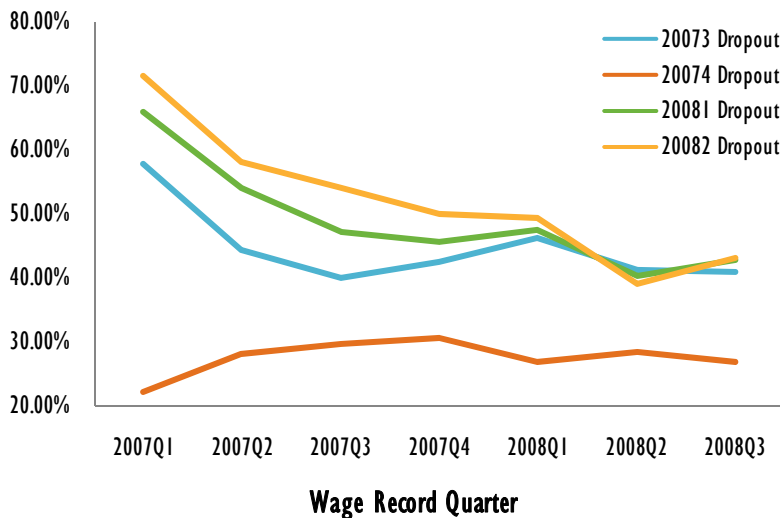
Wage records are a method of determining unemployment insurance (UI) benefits based on quarterly employee wage reports already filed by employers with the state's Unemployment Insurance Agency (UIA). Under federal law, employers are required to submit each employee's quarterly wage records. In Missouri, unemployment insurance is administered by the Missouri Department of Labor and Industrial Relations — Division of Employment Security with funding from the federal government.

### Exiters Not in Wage Records

Next, researchers analyzed workforce employment and wage trends for Missouri 2008 high school exiters with valid social security numbers with breakouts by demographic groups and type of exit from the K-12 public school system. Data was divided into exit cohorts for analysis which were based upon how and when the student exited the system.

Cohort Characteristics - High School Exit Type (% share of cohort by quarter)					
Type of Exit	Exit Date				Total
	20073	20074	20081	20082	
Drop out	78.6%	53.9%	45.7%	1.6%	10.0%
Graduate	11.4%	34.4%	42.4%	98.0%	87.9%
Stop out	10.1%	11.8%	11.9%	0.4%	2.1%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

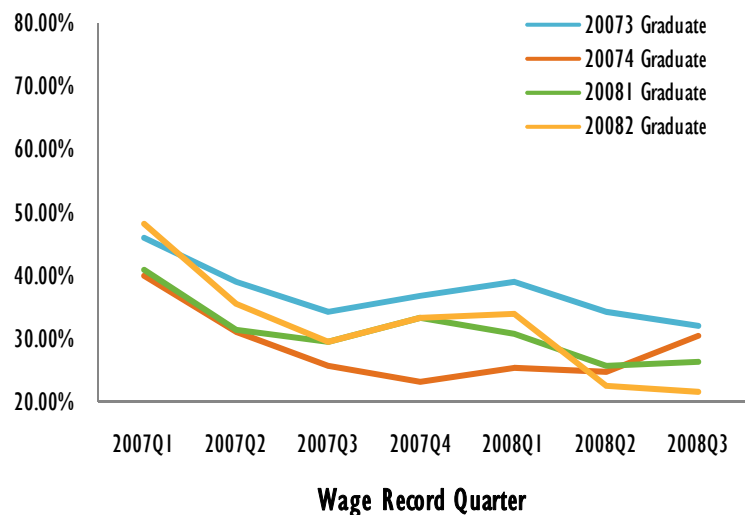
**Percent of Missouri High School Dropouts Not in Missouri Wage Records by Quarter**



Missouri high school students that dropped out in the fourth quarter were more likely to be employed during that same quarter than students that dropped out during other time periods in a school year. This trend may indicate that drop outs in the fourth quarter obtain jobs as a result of openings during the Christmas season. In general, dropouts were twice as likely as graduates to not be employed in Missouri.

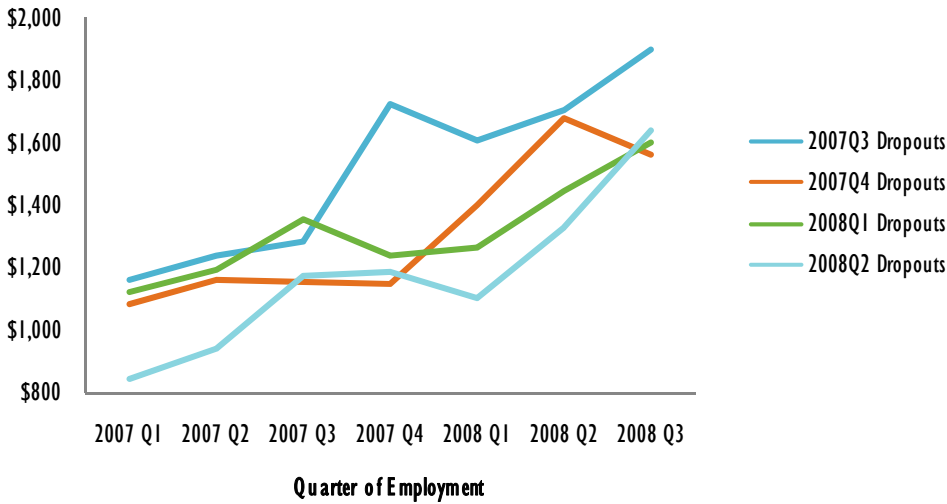
The top three industries that Missouri high school dropouts worked in were: Accommodation and Food Services, Retail Trade, or Administrative Support and Waste Management. Missouri high school graduates were most likely to be employed compared to dropouts and tended to be employed in a greater variety of industries. For Missouri high school graduates not employed immediately after graduation, one likely explanation could be students anticipating fall enrollment at college.

**Percent of Missouri High School Graduates Not in Missouri Wage Records by Quarter**





**Average Wage of High School Dropouts**



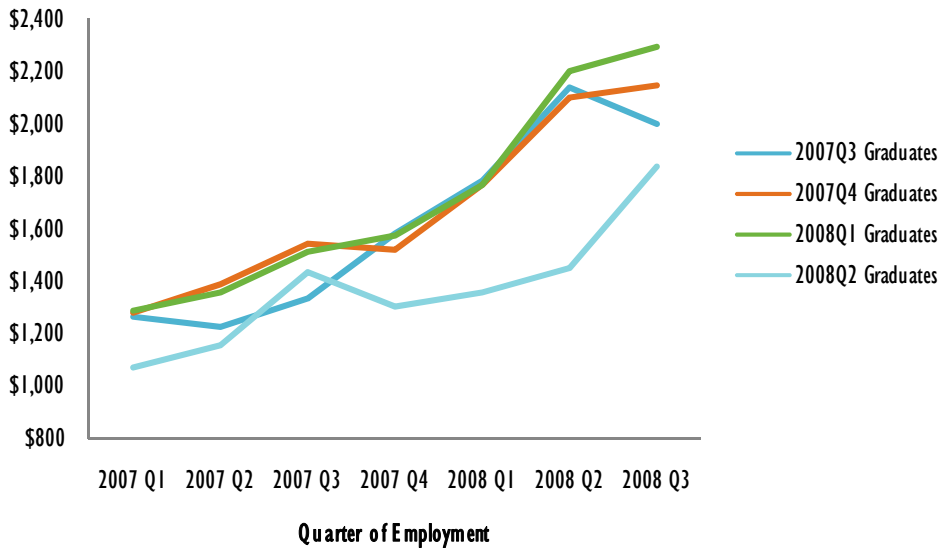
**Wages Over Time**

Immediately after dropping out of high school, Missouri drop outs with valid social security numbers had an increase in income of \$300 to \$400. This trend suggests that a primary reason for dropping out of school may be to take a job.

Missouri high school stopouts in the linked records also seemed to be leaving school to take a job, but within 6 months of the initial dropout event, high school stopouts had an immediate decrease in income. This may indicate that it is an unsuccessful job experience that brings the stopout students back to school.

Analysis of the matched records show that Missouri high school graduates had higher incomes and higher earning potential over time compared to dropouts.

**Average Wage of High School Graduates**



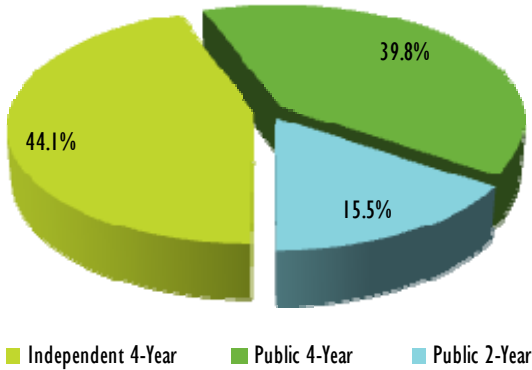


# College Student Follow-up

Researchers conducted analysis on matched records for graduates of 2- and 4-year Missouri public higher education institutions from the 2006-07 academic year, excluding students who appeared as re-enrolled in 2007-08 at a public institution. Also excluded from this analysis were records for doctoral and professional graduates, which the researchers assumed would not be immediately enrolling in other institutions and had completed their education for the short-term. A sample of 13,350 records was submitted to the National Student Clearinghouse for matching against: Private Missouri higher education institutions, Proprietary Missouri higher education institutions, or Out-of-state higher education institutions.

Analysis of the returned, matched records from NSC showed that a total of 3,600 Missouri 2 and 4-year graduates (27.0%) were found to have continued their higher education by re-enrolling after their graduating term.

**Continuing Postsecondary Enrollment of Missouri Postsecondary Graduates by Type of Institution**



- Leading states for re-enrollment were Missouri (2,329), Kansas, and Illinois (172 each), Arizona (99), and Iowa (63).

- The leading institution for in-state enrollment was the University of Missouri (all campuses) at 390 students. Following (and breaking apart campuses) were Webster (218), Lindenwood (147), University of Missouri St. Louis (139), University of Missouri Kansas City (128), and Missouri State (126). St. Louis Community College just misses the top 5, with 121 completers enrolled.

- Leading out-of-state institutions included the University of Phoenix (70, see AZ above), KU and KU Medical School (58 combined), Southern Illinois University (40), Johnson County Community College (36), and Graceland University (19).

## College Dropouts

Additional analysis was conducted to examine whether student academic characteristics would predispose them to transfer or not transfer to any college after disappearing from public sector college enrollment records.

2007-08 Public College Drop-Outs: NSC Follow-Up				
Expectation	Stopped-Out	Transferred to		
		In-State Private College	Transferred Out-of-State	Not Found
Not Expected to Transfer	12.6%	9.7%	11.4%	66.2%
Expected to Transfer	20.9%	10.0%	10.8%	58.3%

\*A "drop-out" here is defined as a student enrolled at a Missouri public college in 2007-08 who did not re-enroll in Fall 2008.

\*\*"Stop-out" is defined as a drop-out who later re-enrolled at a public college, starting in Spring 2009.

\*\*\*"Expectation of transfer" is defined as a student who completed at least 12 credit hours and earned a cumulative GPA of at least 2.0 as of his or her last term enrolled in 2007-08.

Previous research had suggested that students who maintain satisfactory academic progress up to the date of withdrawal from college are more likely to continue their education in the future compared to students who do not have a strong academic record.

The analysis suggests that students with markers of academic progress were more likely to re-enroll at any college than students without a strong academic record. Such students were also more likely to have "stopped-out"—that is, to have taken a break from college before re-enrolling in a public college—compared to their counterparts.

Interestingly, even though the students in the "Expected to Transfer" group did transfer more often than their counterparts overall, they were less likely to be found in an out-of-state school specifically, though the difference is slight.

### STEM Degree Completer Trends

Researchers also conducted analysis on matched records of graduates of Missouri public higher education institutions with NSC records to look at trends for STEM degree completers.

The analysis suggests that STEM completers earning an Associate's degree were much less likely to pursue further study at the post-secondary level than non-STEM completers with the same level of attainment. The differences for other degree levels were slight; the difference for bachelor's degree-holders was statistically negligible. Meanwhile, both certificate and non-terminal graduate degree holders were slightly more likely to consider additional training if they had a STEM background.

Non-STEM Completers (2006-07): NSC Follow-Up				
Award Type	In-State		% Out-of-State	% Not-Found
	% Public	% Private		
Certificate	34.8%	2.2%	2.3%	60.6%
Associate's	45.8%	11.8%	5.2%	37.2%
Bachelor's	18.7%	6.5%	10.0%	64.7%
Non-Terminal Graduate Credential	11.2%	2.4%	6.0%	80.3%

STEM Completers (2006-07): NSC Follow-Up				
Award Type	In-State		% Out-of-State	% Not-Found
	% Public	% Private		
Certificate	35.7%	5.4%	1.7%	57.1%
Associate's	20.5%	15.8%	6.2%	57.4%
Bachelor's	20.6%	5.8%	9.5%	64.2%
Non-Terminal Graduate Credential	14.2%	3.1%	5.5%	77.2%

### Missouri STEM Completer Trends

Overall trends in the number and characteristics of STEM degree completers indicated that Missouri has an equal share of female (50.6%) and male (49.4%) of students pursuing STEM fields. The top STEM degree programs for the 2006-07 degree completers were:

Health Professions and Related Clinical Sciences	35.3%
Engineering	17.0%
Biological and Biomedical Sciences	9.9%
Computer and Information Sciences and Support Services	8.6%
Engineering Technologies/Technicians	6.6%

# College Graduates Employment Trends

Researchers also conducted analysis on matched records of graduates of Missouri public higher education institutions with wage and employment records. Analysis was first conducted to look at trends in wages by gender and race/ethnicity.

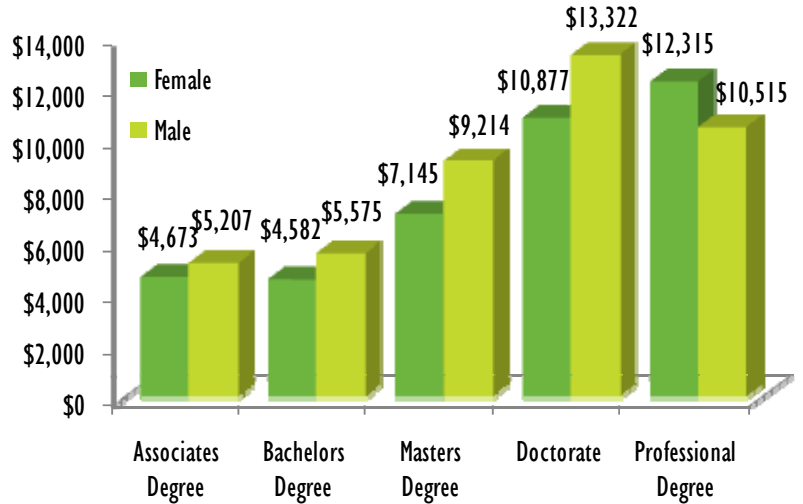
## Demographic Trends

Of the 35,903 Missouri post secondary completers for academic year 2007-2008, 21,081 (58.7%) were female and 14,818 (41.3%) were male. Caucasians comprised 80.4% (28,874) and African Americans comprised 6.4% (2,298) of these completers.

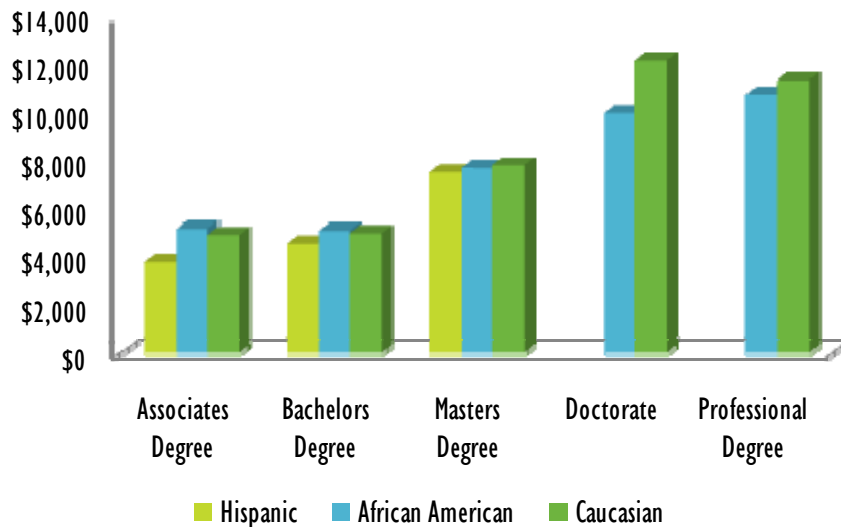
The data demonstrate that Missouri female college graduates earned less than their male counterparts for all degree levels with the exception of attainment of a Professional degree. The largest disparity in earnings after completion of a degree occurred for Missouri females that attained a Masters degree (77.5% of male wages) and a Doctorate degree (81.7% of male wages).

More mixed results were found when comparing wages for Missouri college graduates by race/ethnicity. Wage disparities between African Americans college graduates and their Caucasian counterparts did not occur until attainment of a Master's degree or higher. Hispanic Missouri college graduates consistently earned less than both African American and Caucasian students across all degree levels for which data were available.

Average Wage (2008Q3) for Missouri College Graduates by Gender

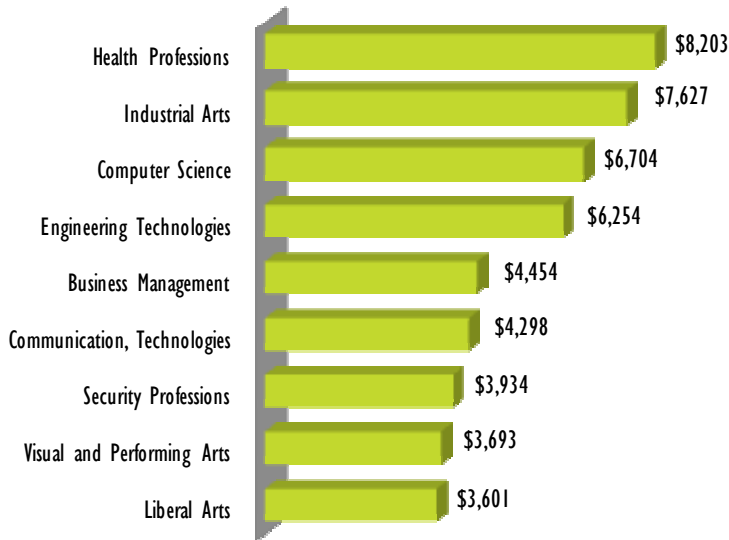


Average Wage (2008Q3) for College Graduates by Race



\*Wage Data for some Hispanic Graduates and for all "Other" racial groupings suppressed for small cell sizes.

**Average Wage (2008Q3) for College Graduates - Associates Degree Completers by Subject**

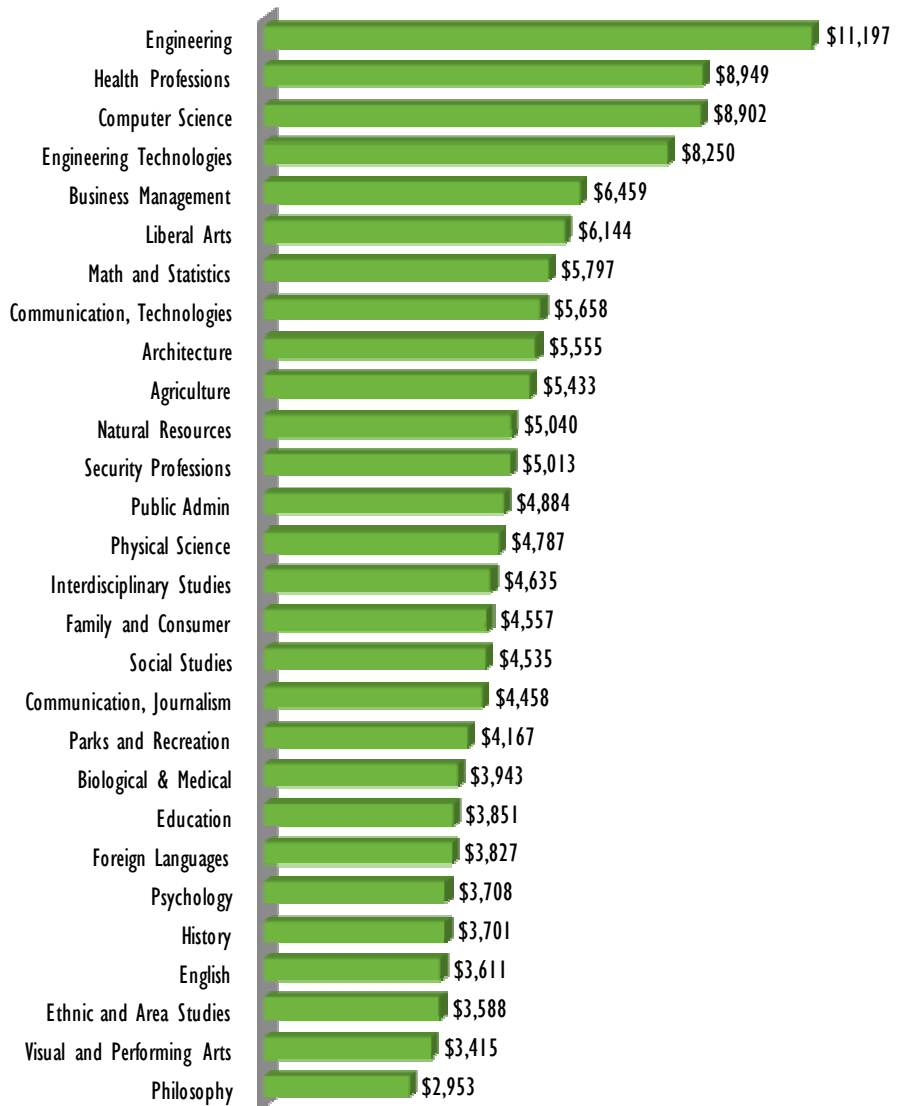


**Type of Degree/Subject Area**

Missouri 2008 graduates that completed a Health Professions Associate's degree earned an average wage comparable to the wages earned for Missouri graduates with an Engineering Technologies Bachelor's degree.

For Missouri graduates of 4-year public institutions, those that graduated with STEM-related degree enjoyed higher wages in the fall following graduation than many of their counterparts with non-STEM-related degrees. The one exception to this trend was for graduates with degrees in STEM-related teacher education.

**Average Wages (2008Q3) for College Graduates- Bachelors Degree Completers by Subject**



**METS Initiative**

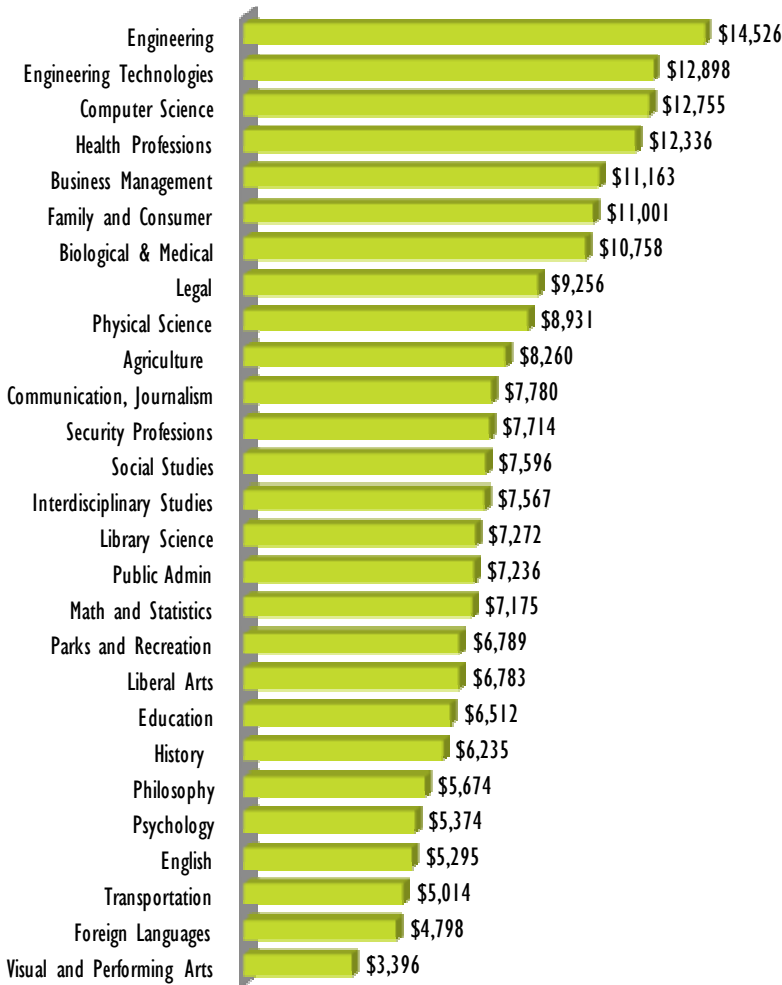
The Math, Engineering, Technology, and Science (METS) initiative in Missouri, led by the Missouri METS Coalition, is designed to raise awareness and to recognize the challenges that Missouri will face in the coming years if more students are not fully prepared for careers that require knowledge and skills in mathematics, engineering, technology, and science.

The initiative has identified four strategic challenges that are central to improving METS-related skills education in Missouri:

1. Improve all students' performance from pre-kindergarten through graduate education,
2. Expand the pool of students motivated to pursuing science, technology, engineering, and mathematical occupations,
3. Expand the pool of Missouri's teachers who focus on these four gateway skills areas, and
4. Increase the public awareness of the importance of gateway skills industries and jobs in enhancing Missouri's competitiveness and innovation.

For more information, visit: [www.missourimets.com](http://www.missourimets.com)

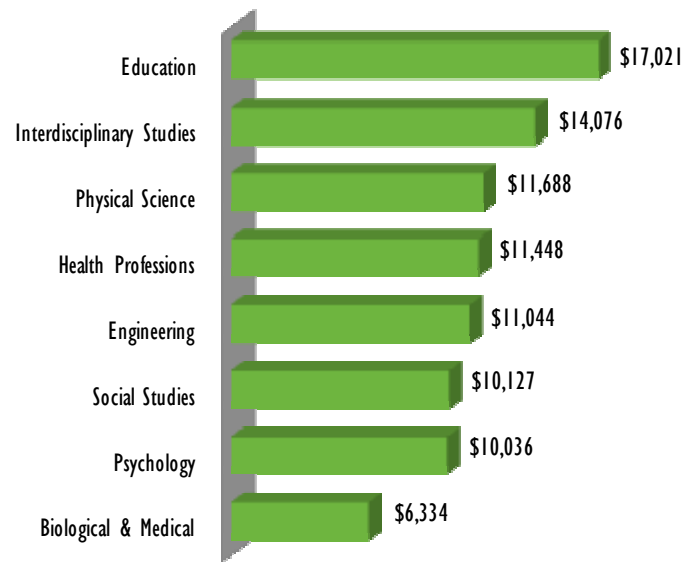
### Average Wages (2008Q3) for College Graduates- Masters Degree Completers by Subject



Of the Missouri 2008 graduates that completed a Master's degree, four of the top five earnings were for those that completed their degree in a STEM-related subject of study.

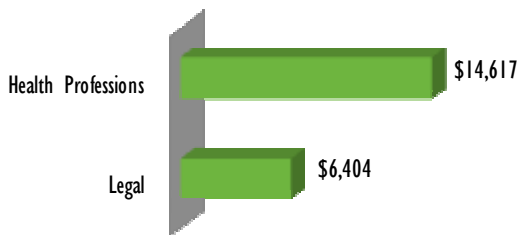
For graduates of Missouri Doctoral degree programs, students with a degree in Education reaped the largest benefit from having continued their education in terms of earning potential.

### Average Wages (2008Q3) for College Graduates- Doctoral Degree Completers by Subject

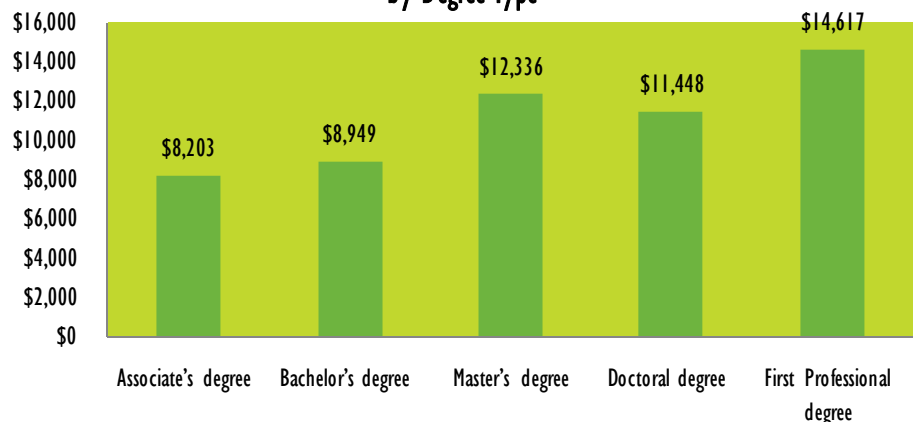


One of the most interesting career pathways for Missouri students in terms of wages earned is Health Professions, a common area of study for many STEM-related occupations. Missouri students that completed a Health Professions degree at any level of degree offered, enjoyed some of the highest wages of any subject area.

### Average Wages (2008Q3) for College Graduates - First Professional Degree Completers by Subject



### Average Wages (2008Q3) for Health Professions Degree Completers by Degree Type

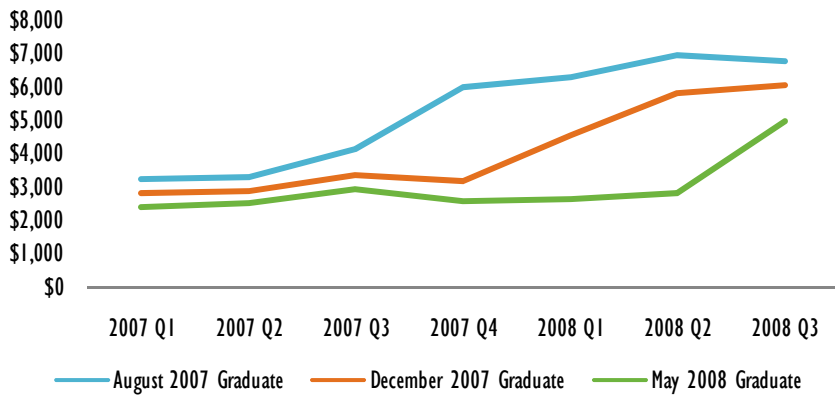


**Date of Graduation**

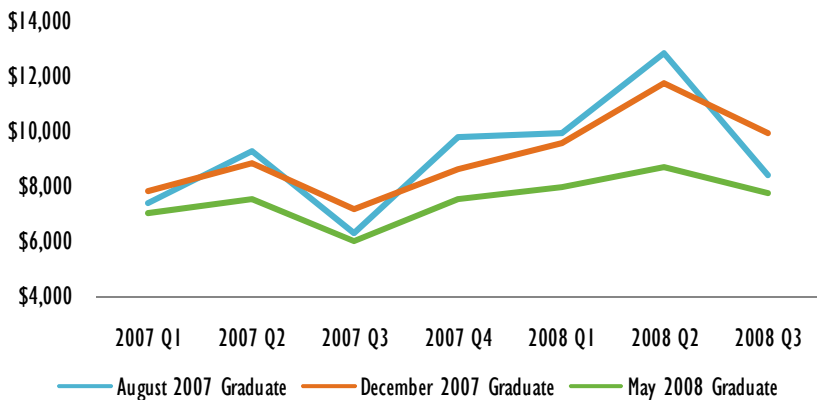
Matched records of Missouri 2008 college graduates and Missouri wage records were analyzed over time to investigate any effect of time of graduation on earning both prior to and after exiting. Graduate earnings were analyzed over seven quarters from the first quarter of 2007 to the third quarter of 2008. There were 7,422 (20.67%) of Missouri college completers who were not included in the UI wage records at any time during this period.

Of these graduates, 5,422 (15.1%) completed their degrees in August of 2007, 10,908 (30.4%) completed their degrees in December of 2007, and 19,573 (54.5%) completed their degrees in May of 2008.

**Average Wage of Missouri Bachelors Degree Graduates**



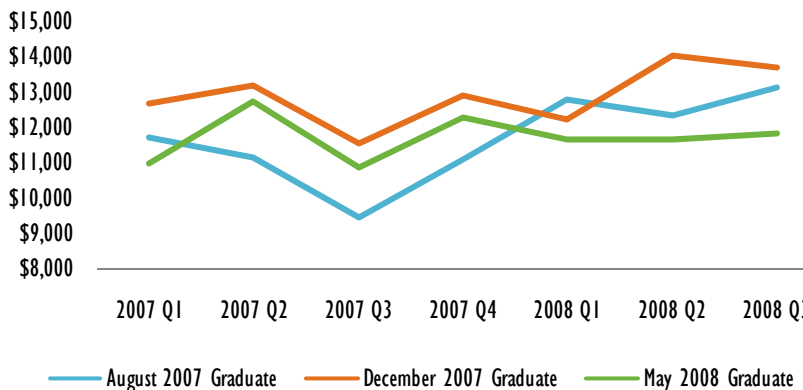
**Average Wage of Missouri Masters Degree Graduates**



A majority of employed Bachelors degree (54.7%), Masters degree (68.8%), and Doctoral degree (62.5%) graduates showed up consistently in the wage records over the entire seven quarters. Return on investment for a completed degree began if at all only after the degree was completed. There was a pronounced increase in average wage during the quarter immediately following completion of the degree when no other factors were taken into account.

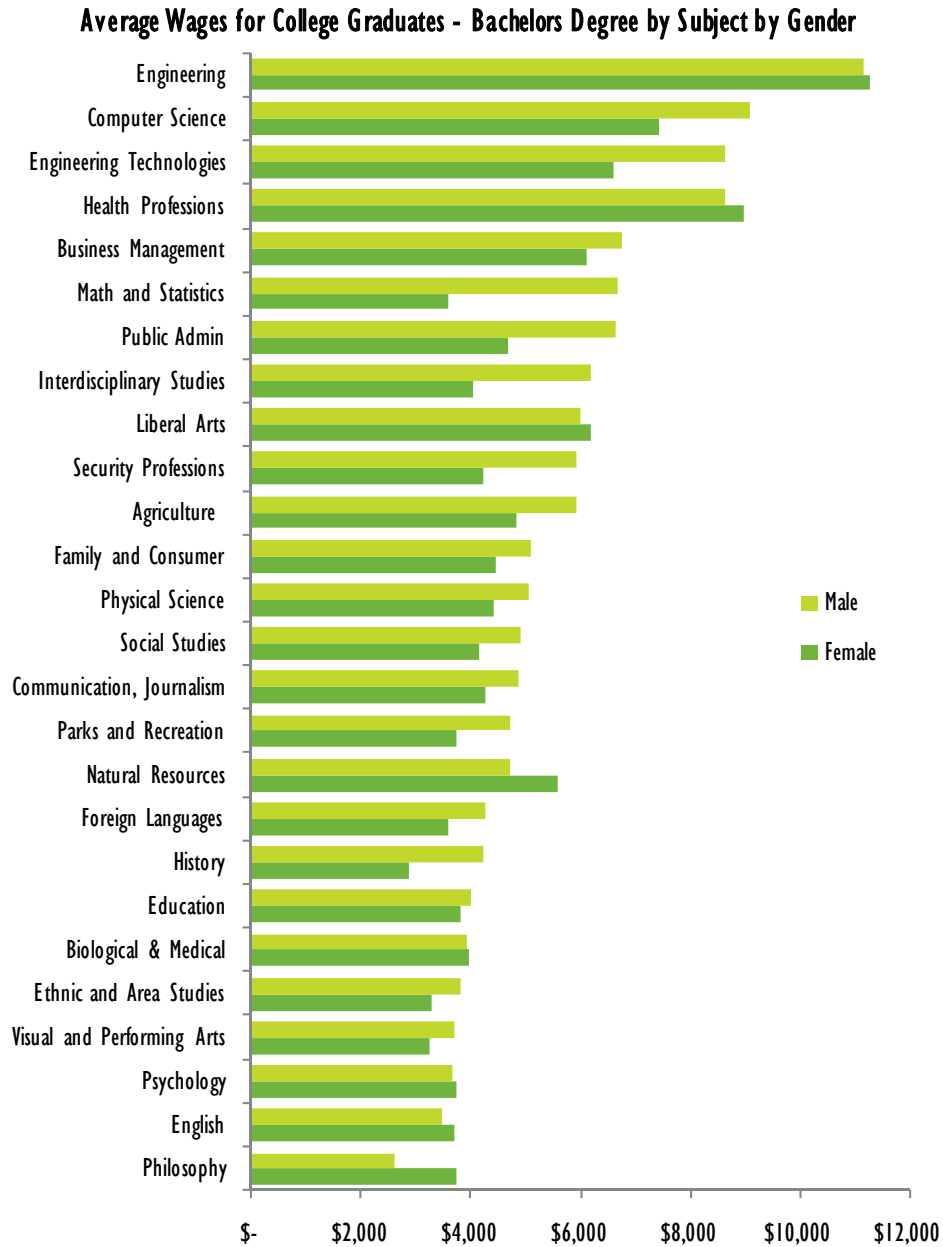
The lack of significant wage growth for doctoral degree completers may indicate a lack of job change among these degree completers. The dramatic change in wage for first professional degree completers may indicate a lack of ability to take on significant employment until the degree is obtained.

**Average Wage of Missouri Doctoral Degree Graduates**



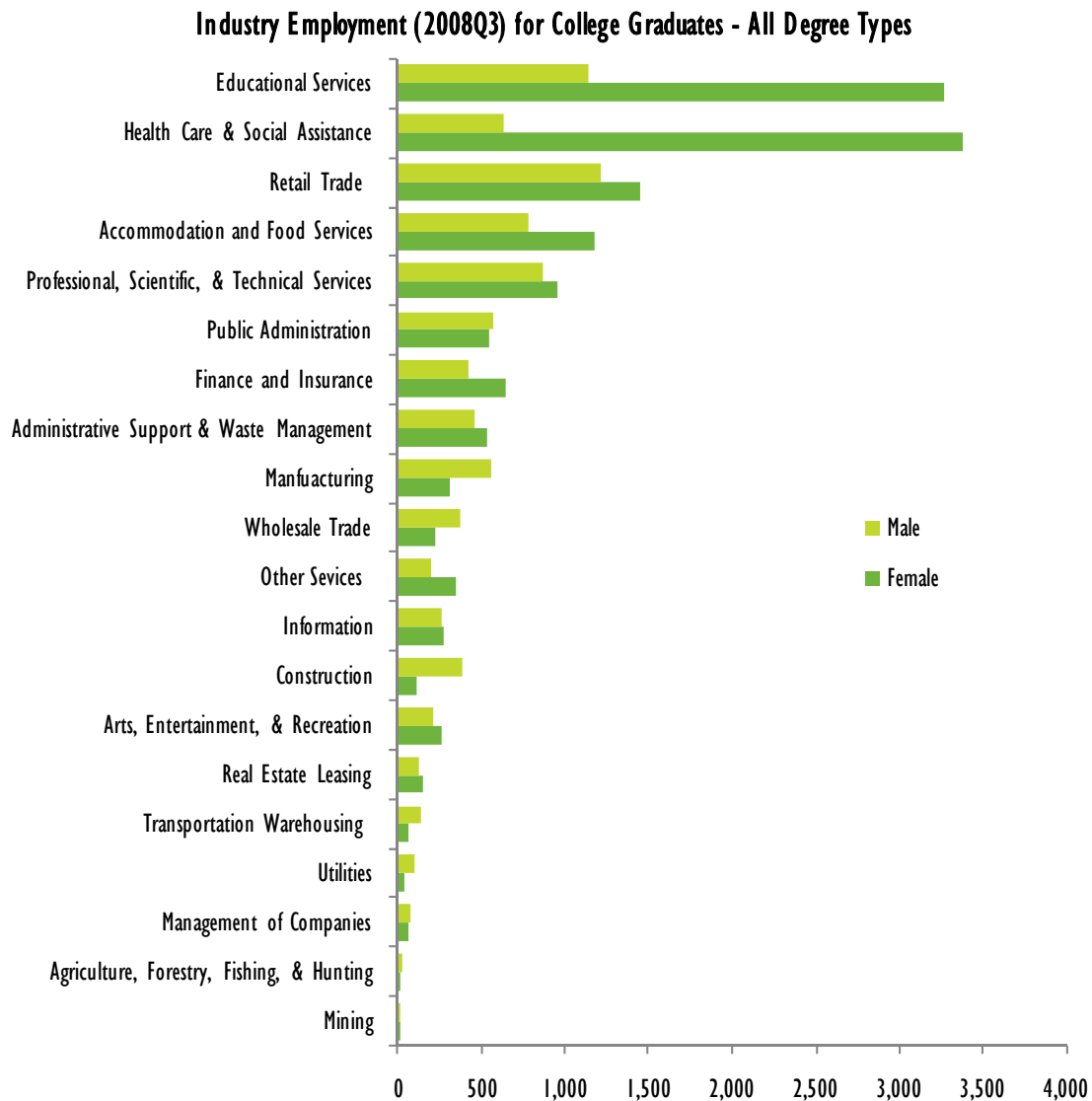
**Subject Area by Gender**

Additional analysis of matched records was conducted for gender differences in subject area of study for Bachelor's degrees. Male and female 4-year college graduates in Missouri were graduating with the same types of Bachelor's degrees overall. Of the most popular Bachelor's degree programs (by highest number of graduates) 17 out of 20 subject areas were the same for both male and female completers, with Business Management the most popular for both genders. However, in only 8 of the 26 different types of Bachelor's degrees did female graduates earn more than their male counterparts after graduation.



## Industry Employment and Wages

Additional analysis was conducted for gender differences in industry of employment for 2007-08 Missouri college graduate records matched with wage records for the third quarter of 2008. Female college graduates of all degree types constituted the largest share of graduates finding employment in the Educational Services and Healthcare & Social Assistance sectors. Conversely, male college graduates constituted the largest share of graduates finding employment in Construction, Agriculture, and Utilities industry sectors.



Analysis of earnings by industry was also conducted for 2007-08 college graduates of all degree types. Male college graduates earned more than their female counterparts after graduation in 17 out of 20 industry sectors. The gender wage disparity for college graduates was largest in these industries:

- Manufacturing
- Information Services
- Professional, Scientific, & Technical Services



## Conclusion

Most if not all of the knowledge gained through this project can be transferred to the implementation of a longitudinal data system that is based upon education and workforce data. In addition to the new analysis of linked records, other numerous tangible benefits have already accumulated due to the work of all staff and agencies involved.

In addition to the formal agreements and relationships that have been established between the P-20 Council departments—discussions, data identification, and data linking have led to the formation of an informal P-20 Interagency Data Workgroup. Continuation of this type of workgroup to discuss issues such as data, policy, access, data repositories/warehouse functionality will provide for a useful and supported longitudinal data system. This project has provided an opportunity—a learning experience—which can be transferred to the implementation of a longitudinal data system.

Included in the contractual agreement between the Missouri Department of Higher Education and OSEDA was an analysis of alternative methods of matching administrative records. Comparing various methods using the existing NGA Grant provided datasets as well as planning/discussing the future use of the MOSIS Identifier linked to social security numbers was a valuable outcome of the overall project.

### Going Forward

It is the hope of the researchers that the analysis included in this report, in addition to analysis contained in the other two P-20 stakeholder feedback reports for elementary/secondary and postsecondary education, serves as a starting point for conversations about the current state of Missouri's P-20 pipeline. While numerous reports and initiatives in the past have stated the importance of linking unit record data across P-20 state agencies, this report serves as the first attempt in Missouri to actually link and analyze such information. The purpose of such analysis is to better inform both the general public and policy makers about various issues that Missouri students face in transitioning between the K-12, college, and workforce systems.

As statewide data systems become more integrated and robust in terms of analytical capabilities, additional and more nuanced research will be possible over the next few years. Recent national initiatives such as the U.S. Department of Education's Race to the Top have at their centerpiece a push for states to continue to develop and improve their P-20 longitudinal data systems for the purpose of better informing policymakers and educational reform. National leaders recognize the importance of having a seamless transition for students throughout the education system who are ultimately prepared with the skills needed for the New Economy.

Data gives us the roadmap to reform. It tells us where we are, where we need to go, and who is most at risk.  
Hopefully some day we can track kids from pre-school to high-school and from high school to college and college to career.

-U.S. Secretary of Education Arne Duncan, June 8, 2009



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