



National Center for Higher Education Management Systems

# Why Higher Education Costs are What They Are

Submitted to  
Colorado Department of Higher Education  
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## Why Higher Education Costs are What They Are

As a part of its contract with the Colorado Department of Higher education (CDHE), the National Center for Higher Education management Systems (NCHEMS) undertook an extensive series of analyses of higher education costs. These analyses are intended to:

- Provide insights that could inform the deliberations regarding the development of tuition policy by the Colorado Commission on Higher Education.
- Help address the question of why higher education costs are what they are.
- Explain why costs differ across different types of institutions.

These analyses were not designed to explain or draw attention to the costs or cost patterns of individual institutions.

In order to interpret the findings of these analyses, it is necessary to understand two fundamental points. First, there is no “right” or “standard” way to deliver higher education programs and services. As a result there is no dollar amount that represents what it should cost. Analyses, therefore, are cast in terms of comparisons with industry practices, not industry standards. Second, the real determinant of higher education costs is higher education revenues. Howard Bowen, a distinguished higher education leader and researcher, noted that institutions raise all the money they can and spend all they raise, an observation that has become known as Bowen’s Law. The validity of this claim has been reaffirmed by NCHEMS analyses; these analyses found that 97% of the variance in institutional expenditures is explained by available revenues.

The fact that Colorado has fewer resources in all sectors of higher education than most other states explains much of the cost information presented in this document.

As is shown in the following charts, the revenues per student available to Colorado institutions is substantially less than revenues available to similar institutions in most other states. Throughout this document Colorado institutions in each of the categories used are as follows:

### Public Research

- University of Colorado Denver
- University of Colorado Boulder
- Colorado School of Mines
- Colorado State University Fort Collins
- University of Northern Colorado

### Public Masters and Bachelors

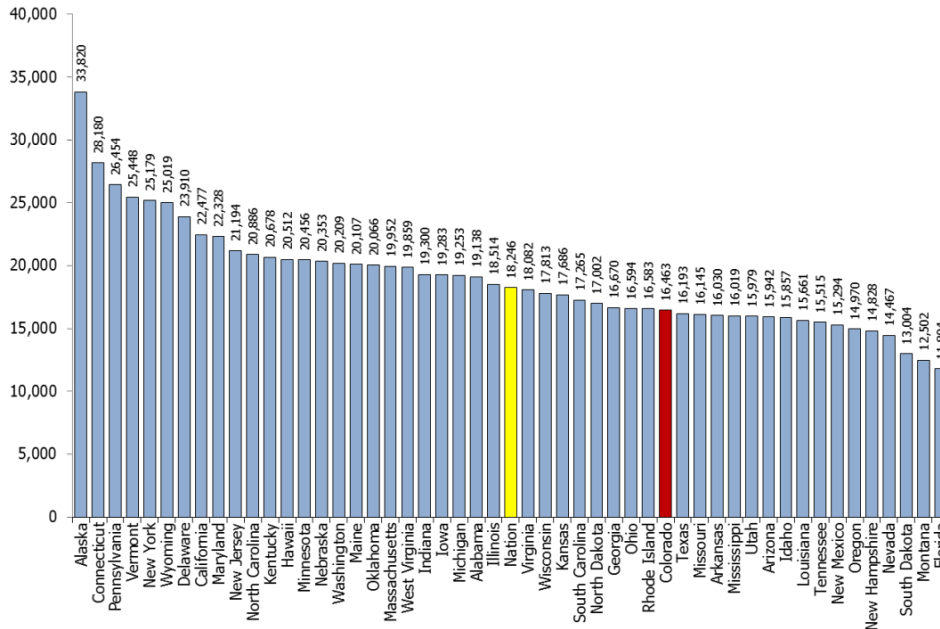
- Adams State University
- University of Colorado – Colorado Springs

- Fort Lewis College
- Colorado Mesa University
- Metropolitan State University of Denver
- Colorado State University – Pueblo
- Western State Colorado University

### **Community Colleges**

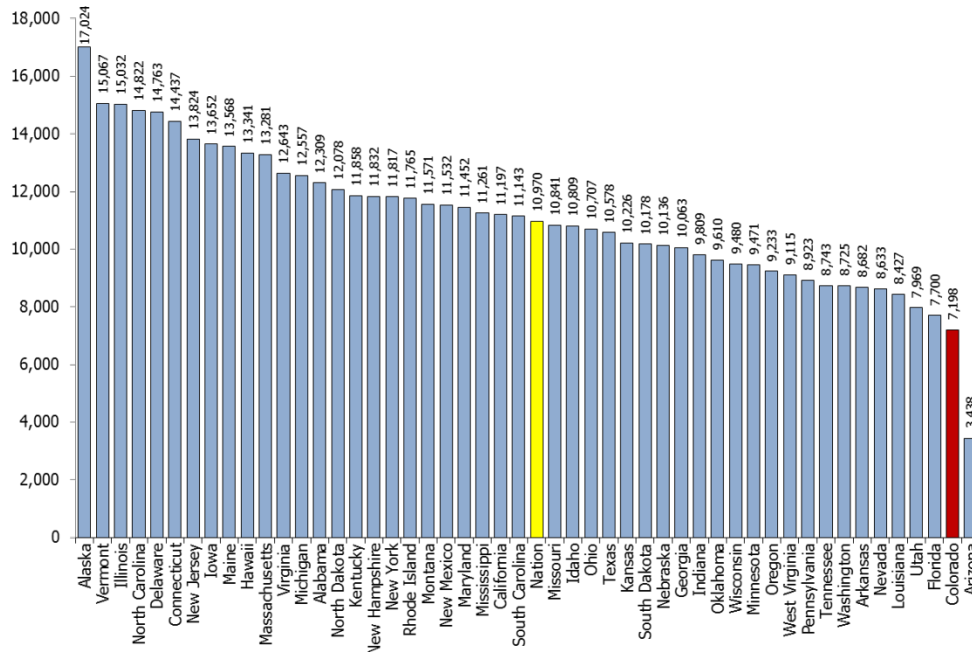
- Colorado Northwestern Community College
- Community College of Aurora
- Community College of Denver
- Front Range Community College
- Lamar Community College
- Morgan Community College
- Northeastern Junior College
- Otero Junior College
- Pikes Peak Community College
- Pueblo Community College
- Red Rocks Community College
- Trinidad State Junior College

**Figure 1. Funding from Tuition & Fees and State Appropriations per FTE Student, Public Research (Includes Medical), 2012-13**



Sources: NCES, IPEDS 2012-13 Provisional Release Finance Files; f1213\_f1a, f1213\_f2 GASB & FASB Finance Files; NCES, IPEDS 2012-13 Instructional Activity File; efa2013 Provisional Release Data File; NCES, IPEDS 2013-14 Institutional Characteristics File; hd2013 Provisional Release Data File. Colorado institutions included in the calculation include University of Colorado Denver, University of Colorado Boulder, Colorado School of Mines, Colorado State University Fort Collins, and University of Northern Colorado.

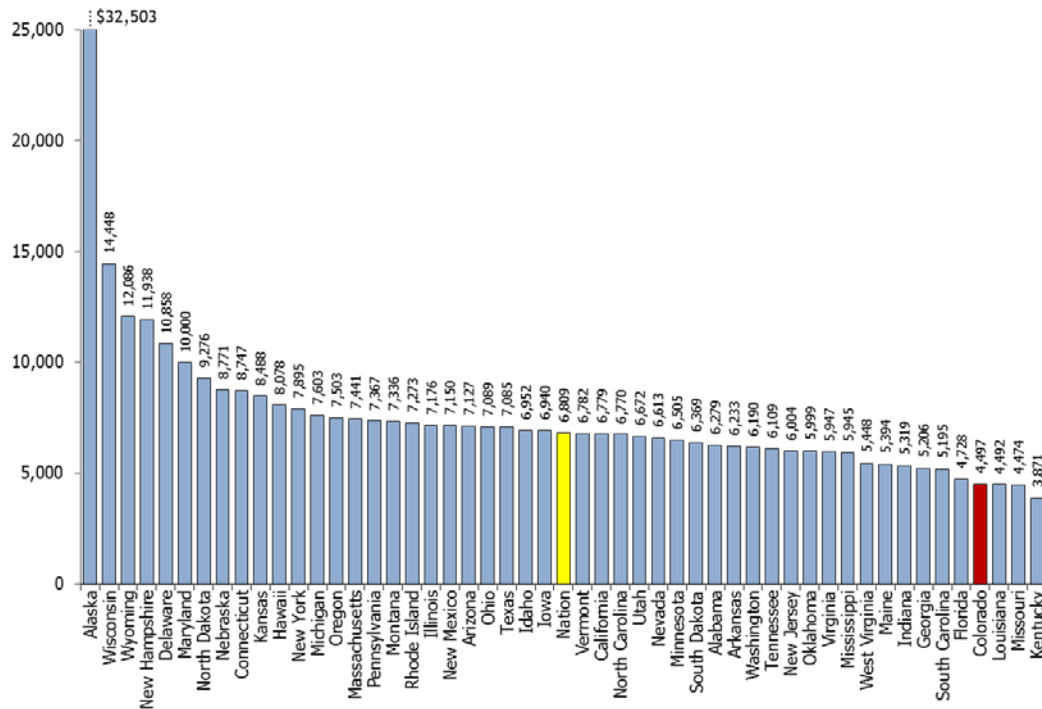
**Figure 2. Funding from Tuition & Fees and State Appropriations per FTE Student, Public Masters, Bachelors, Other 4-Year, 2012-13**



Sources: NCES, IPEDS 2012-13 Provisional Release Finance Files; f1213\_f1a, f1213\_f2 GASB & FASB Finance Files; NCES, IPEDS 2012-13 Instructional Activity File; efa2013 Provisional Release Data File; NCES, IPEDS 2013-14 Institutional

Characteristics File; hd2013 Provisional Release Data File. Colorado institutions in this category are Adams State University, University of Colorado – Colorado Springs, Fort Lewis College, Colorado Mesa University, Metropolitan State University of Denver, Colorado State University – Pueblo, Western State Colorado University.

**Figure 3. Funding from Tuition & Fees and State Appropriations per FTE Student, Public Associates and Other 2-Year, 2012-13**



Sources: NCES, IPEDS 2012-13 Provisional Release Finance Files; f1213\_f1a, f1213\_f2 GASB & FASB Finance Files; NCES, IPEDS 2012-13 Instructional Activity File; efi2013 Provisional Release Data File; NCES, IPEDS 2013-14 Institutional Characteristics File; hd2013 Provisional Release Data File. Colorado institutions in this category are Colorado Northwestern Community College, Community College of Aurora, Community College of Denver, Front Range Community College, Lamar Community College, Morgan Community College, Northeastern Junior College, Otero Junior College, Pikes Peak Community College, Pueblo Community College, Red Rocks Community College, Trinidad State Junior College.

However strong the explanatory power of Bowen’s Law, there are additional factors that must be considered in any attempt to understand the costs of higher education. To investigate these factors, NCHEMS undertook two very different kinds of analyses, one a simple look at some of the obvious cost drivers and the other a much more sophisticated series of statistical analyses. Together they help to shed light on the question of why the costs of operating colleges and universities are what they are.

The explanation of college costs starts with a recognition that higher education is a people-intensive industry. Its key assets are faculty and the other highly educated staff that are required to teach students, conduct research, and manage complicated, multi-million (billion) dollar enterprises.

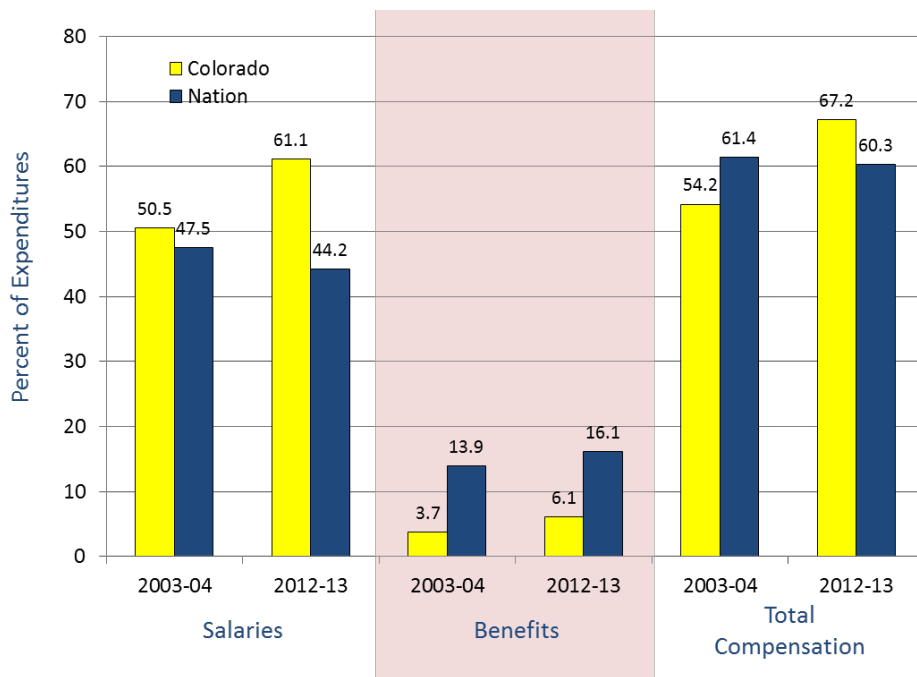
The following charts indicate the proportion of institutional expenditures devoted to salaries and benefits and the ways in which these expenditures have changed over the past decade.

**Figure 4. Compensation as a Percent of Expenditures, 2003-04 Compared to 2012-13, Research Universities (Includes Medical)**



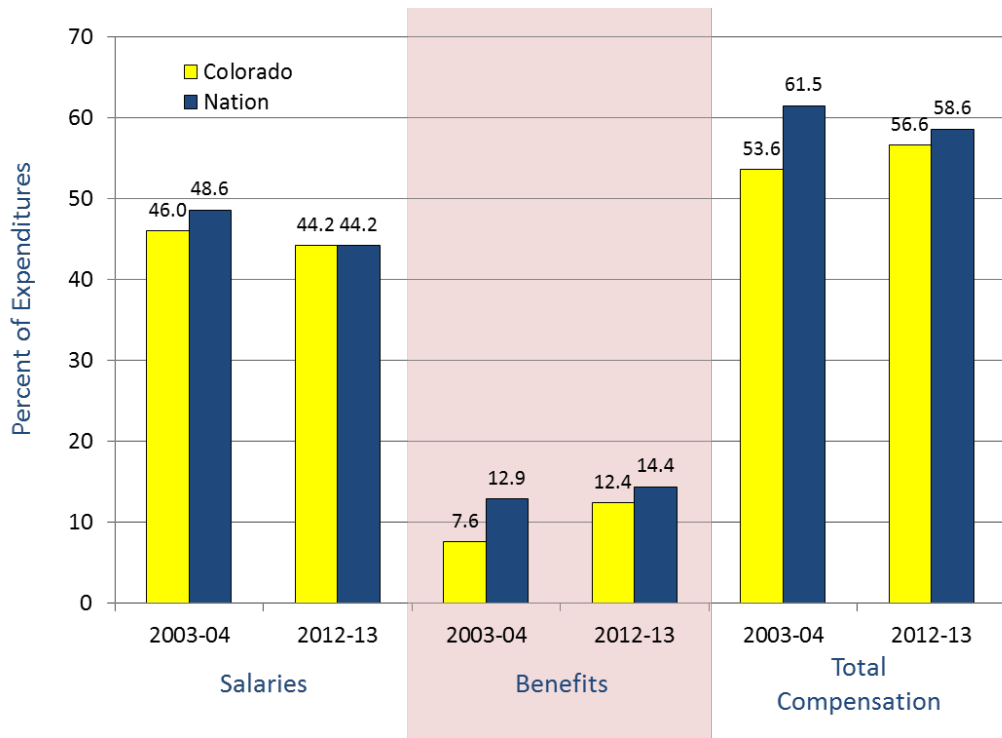
Source: NCES, IPEDS 2003-04 Finance Files; f0304\_f1a and f0304\_f2 Final Release Data Files. NCES, IPEDS 2012-13 Finance Files; f1213\_f1a and f1213\_f2 Final Release Data Files.

**Figure 5. Compensation as a Percent of Expenditures, 2003-04 Compared to 2012-13, Public 4-year**



Source: NCES, IPEDS 2003-04 Finance Files; f0304\_f1a and f0304\_f2 Final Release Data Files. NCES, IPEDS 2012-13 Finance Files; f1213\_f1a and f1213\_f2 Final Release Data Files.

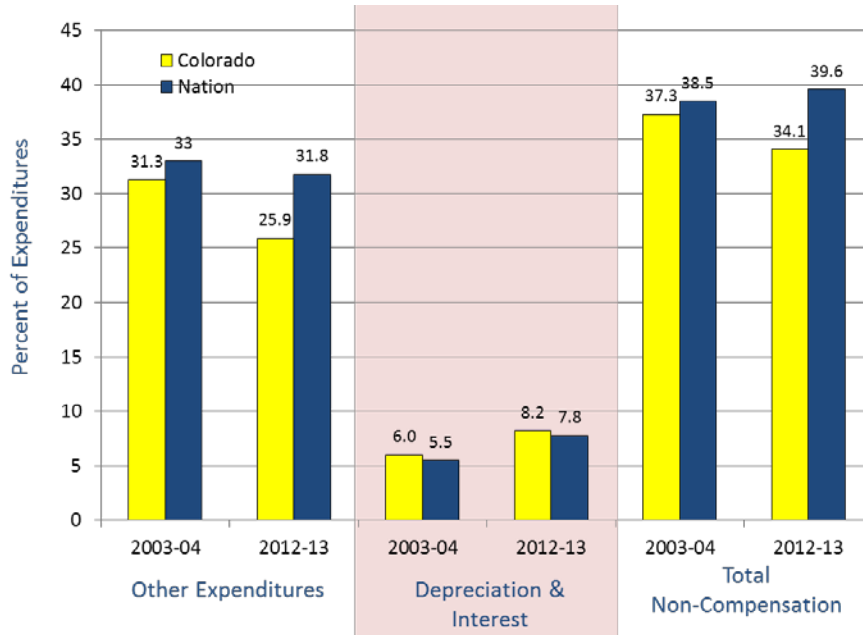
**Figure 6. Compensation as a Percent of Expenditures, 2003-04 Compared to 2012-13, Public 2-Year**



Source: NCES, IPEDS 2003-04 Finance Files; f0304\_f1a and f0304\_f2 Final Release Data Files. NCES, IPEDS 2012-13 Finance Files; f1213\_f1a and f1213\_f2 Final Release Data Files.

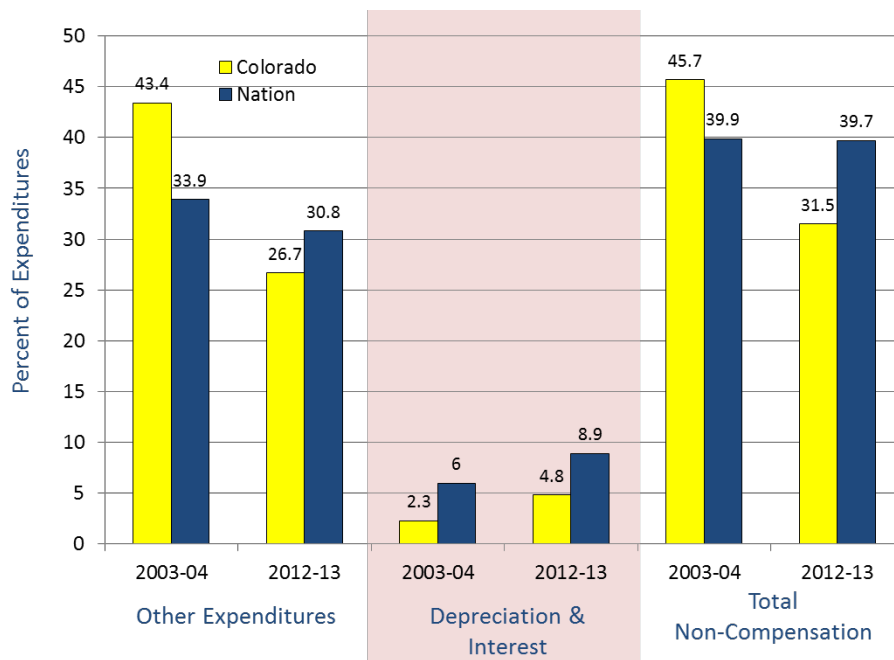
The data in these charts show that all types of institutions spend well more than half of their funds on employee compensation. The balance is devoted to supplies and operating expenses (utilities, insurance, office and laboratory supplies, etc.) interest, and depreciation. The following charts compare the expenditures of Colorado institutions with their counterparts elsewhere in the country.

**Figure 7. “Other” and Depreciation & Interest as a Percent of Expenditures, 2003-04 Compared to 2012-13, Public Research (Includes Medical)**



Source: NCES, IPEDS 2003-04 Finance Files; f0304\_f1a and f0304\_f2 Final Release Data Files. NCES, IPEDS 2012-13 Finance Files; f1213\_f1a and f1213\_f2 Final Release Data Files.

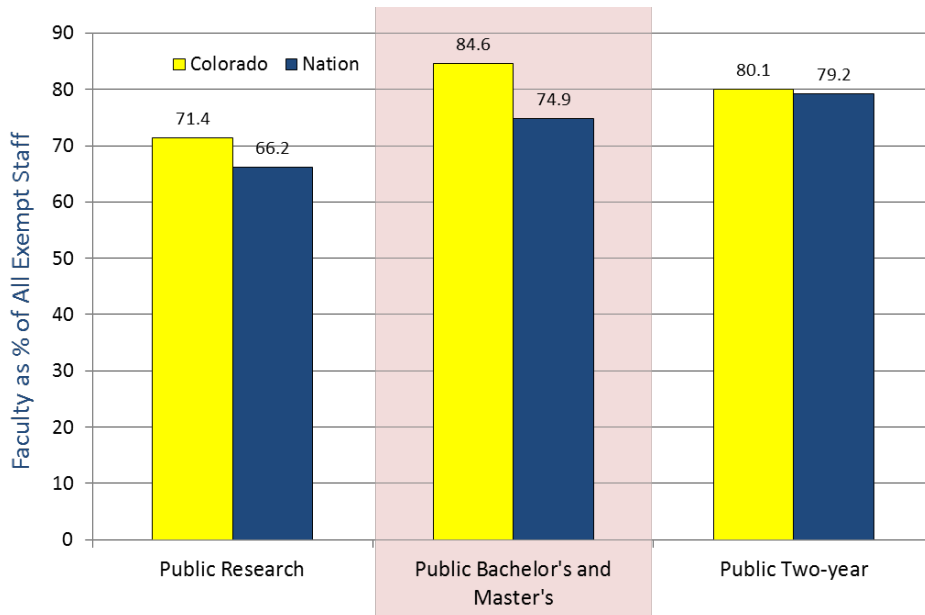
**Figure 8. “Other” and Depreciation & Interest as a Percent of Expenditures, 2003-04 Compared to 2012-13, Public 4-Year**



Source: NCES, IPEDS 2003-04 Finance Files; f0304\_f1a and f0304\_f2 Final Release Data Files. NCES, IPEDS 2012-13 Finance Files; f1213\_f1a and f1213\_f2 Final Release Data Files.

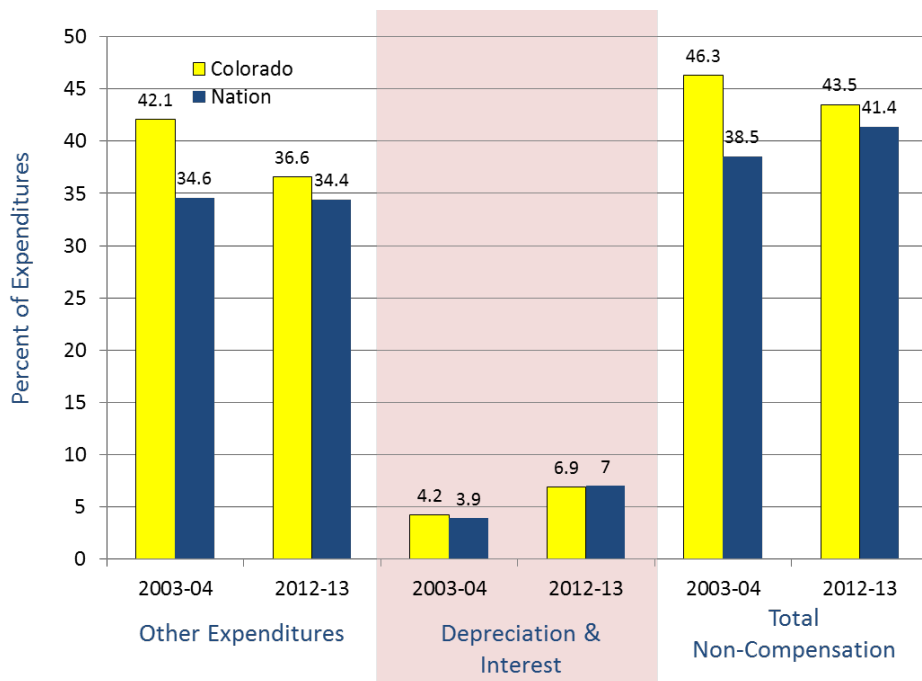


**Figure 9. Faculty as a Percent of All Exempt Staff - Fall 2013**



Source: NCHEMS NCES IPEDS EAP Survey, Fall 2013

**Figure 10. "Other" and Depreciation & Interest as a Percent of Expenditures, 2003-04 Compared to 2012-13, Public 2-Year**



Source: NCES, IPEDS 2003-04 Finance Files; f0304\_f1a and f0304\_f2 Final Release Data Files. NCES, IPEDS 2012-13 Finance Files; f1213\_f1a and f1213\_f2 Final Release Data Files.

All sectors in Colorado have increased spending on depreciation and interest over the past decade, but the share of the budget devoted to expenditures for items other than compensation has declined

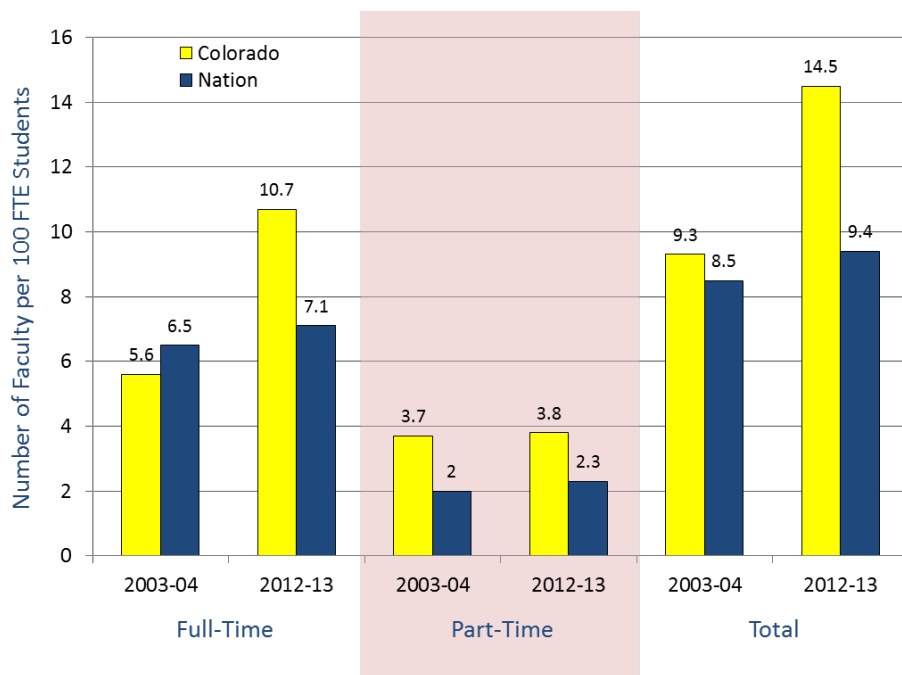
substantially in all sectors during this time period. Recognizing the importance of talented employees to their missions, Colorado institutions are spending more of their available resources on compensation.

Because higher education is labor intensive, the costs of higher education are largely determined by factors related to institutions' human assets, particularly

- The numbers of employees in each category – faculty, managers, non-managerial professionals, technical support, clerical support, etc.
- The conditions of their employment, e.g., full-time versus part-time
- Salary levels

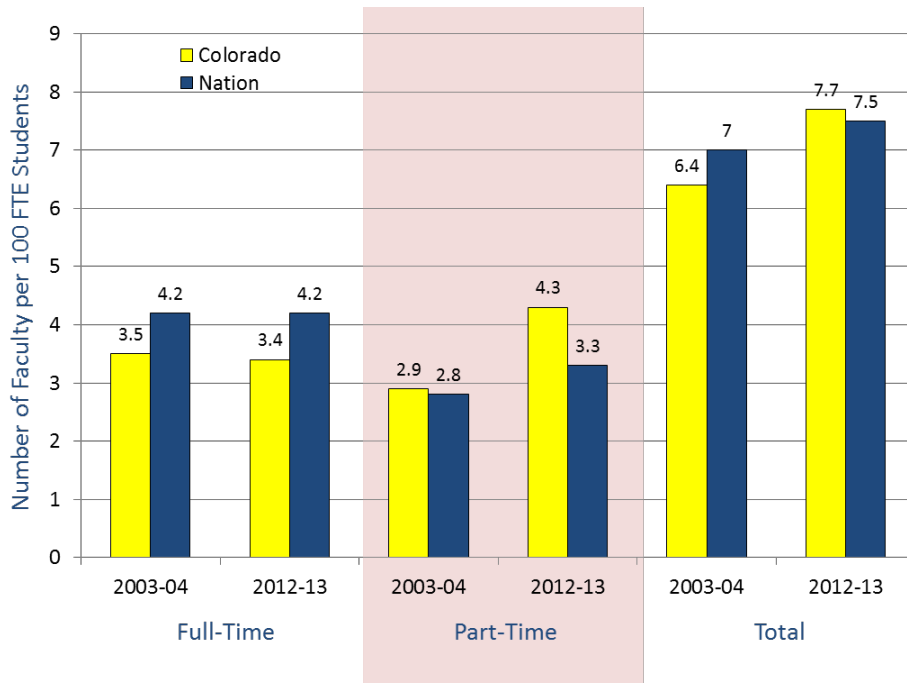
Individual institutions have enormous leeway in their staffing decisions; they can have a richer or leaner student to faculty mix, rely more or less heavily on part-time employees, have more or fewer student support staff, and pay their employees more or less well. All of these decisions ultimately affect the learning environment and student experience on campus as well as the likelihood that students will successfully complete a program of study. Faculty staffing levels and patterns at Colorado institutions vis-à-vis their national counterparts are shown in the following charts:

**Figure 11. Faculty per 100 FTE Students, 2003-04 Compared to 2012-13, Public Research (Includes Medical)**



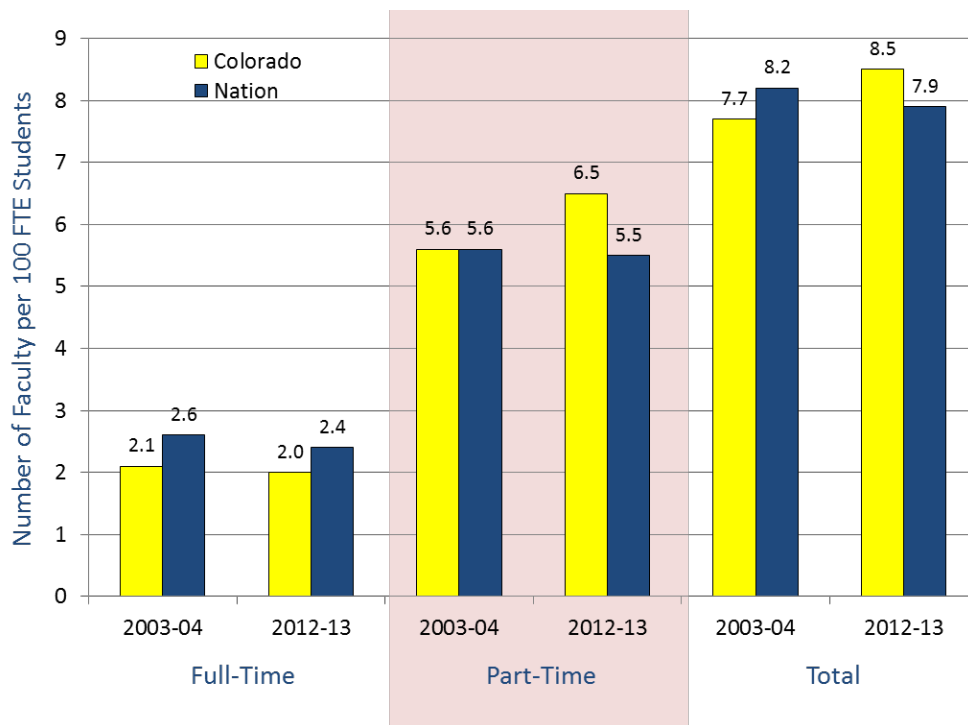
Source: NCES, IPEDS Fall 2003 Staff File; s2003\_abd Final Release Data File. NCES, IPEDS Fall 2013 Staff File; s2013\_oc Provisional Release Data File.

**Figure 12. Faculty per 100 FTE Students, 2003-04 Compared to 2012-13, Public 4-Year**



Source: NCES, IPEDS Fall 2003 Staff File; s2003\_abd Final Release Data File. NCES, IPEDS Fall 2013 Staff File; s2013\_oc Provisional Release Data File.

**Figure 13. Faculty per 100 FTE Students, 2003-04 Compared to 2012-13, Public 2-Year**



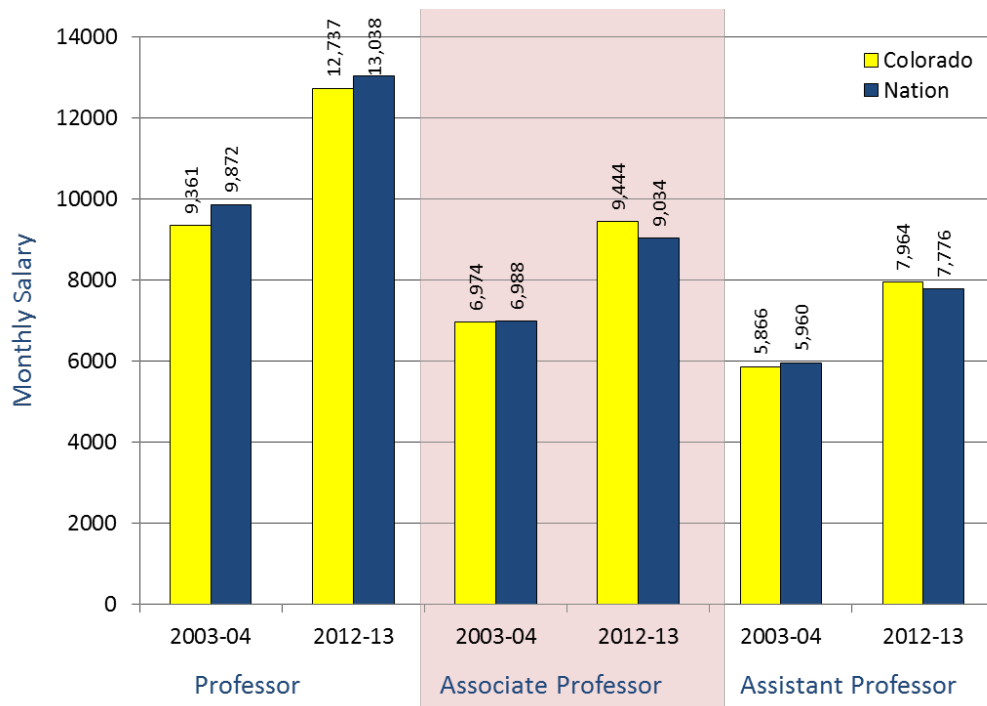
Source: NCES, IPEDS Fall 2003 Staff File; s2003\_abd Final Release Data File. NCES, IPEDS Fall 2013 Staff File; s2013\_oc Provisional Release Data File.

Of note are the relatively low numbers of full-time faculty and the heavy reliance on part-time faculty in those Colorado institutions that have instruction of undergraduate students as their primary mission.

The shift to part-time faculty is harder at research universities because of the necessity of full-time faculty to carry out the very important research missions at these institutions. The fact that Colorado institutions are very successful at attracting research funding largely explains the higher number of faculty per student at the state’s research universities.

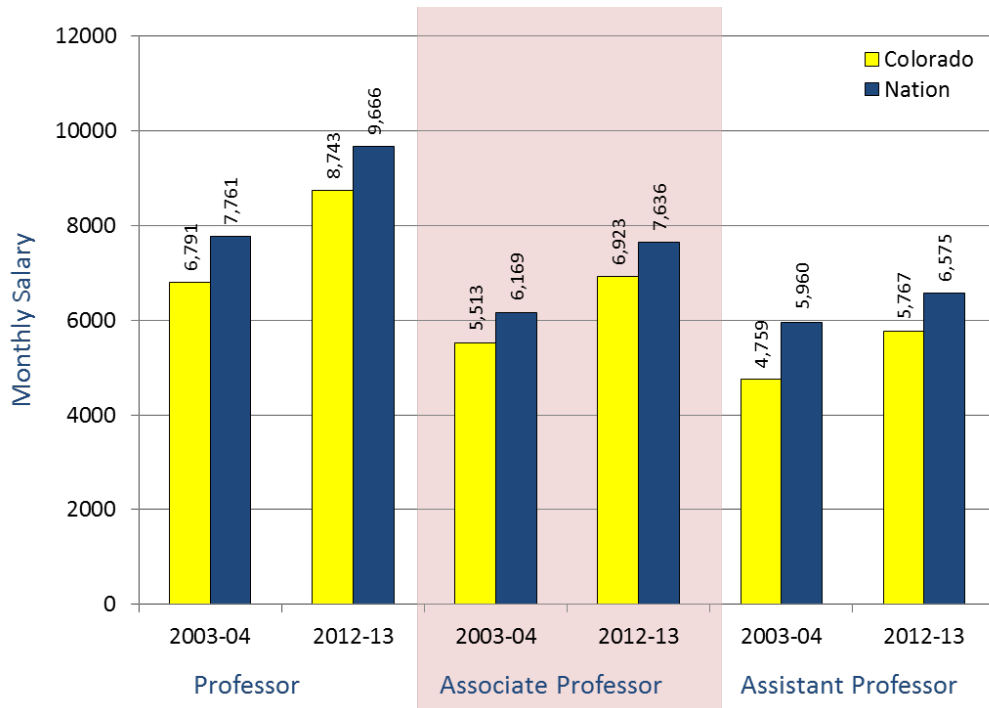
Salary comparisons are as follows:

**Figure 14. Monthly Salary Comparisons, 2003-04 Compared to 2012-13, Public Research (Includes Medical)**



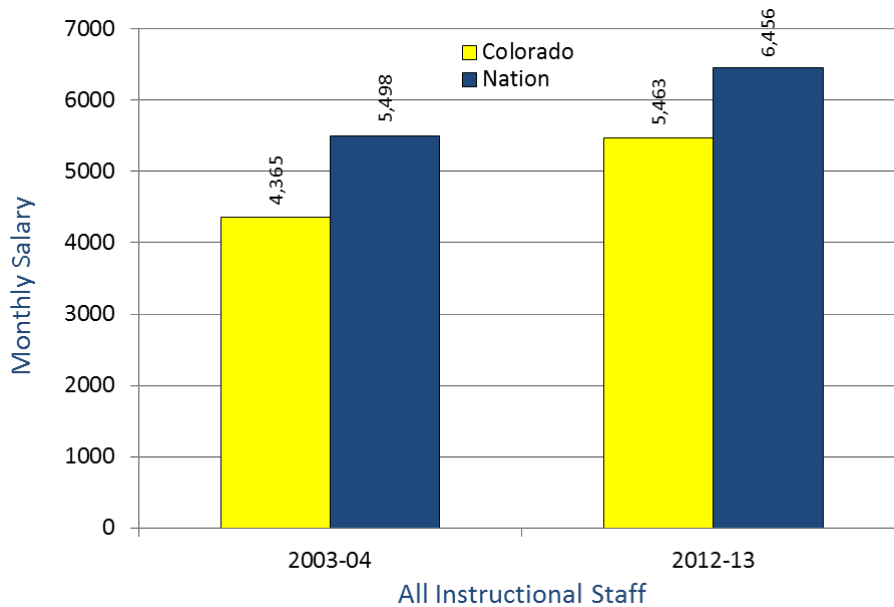
Source: NCES, IPEDS 2003-04 Faculty Salary File; sal2003\_a Final Release Data File. NCES, IPEDS 2012-13 Faculty Salary File; sal2012\_is Provisional Release Data File.

**Figure 15. Monthly Salary Comparisons, 2003-04 Compared to 2012-13, Public 4-Year**



Source: NCES, IPEDS 2003-04 Faculty Salary File; sal2003\_a Final Release Data File. NCES, IPEDS 2012-13 Faculty Salary File; sal2012\_is Provisional Release Data File.

**Figure 16. Monthly Salary Comparisons, 2003-04 Compared to 2012-13, Public 2-Year**



Source: NCES, IPEDS 2003-04 Faculty Salary File; sal2003\_a Final Release Data File. NCES, IPEDS 2012-13 Faculty Salary File; sal2012\_is Provisional Release Data File.

The research universities have managed to maintain salary competitiveness (as measured broadly, not necessarily against specific institutions they would select as their narrower peer group). The other institutions in the state have not. Maintenance of salary competitiveness is a necessity for research universities. They hire in a national market and their ability to hire highly qualified faculty is a major factor in their ability to garner research funds. Failure to maintain competitive salaries would threaten these universities' standings in the research community and the associated contribution to the state's economy.

While institutions have discretion as to staffing patterns and the results they yield, there are institutional factors, largely reflecting mission features, which significantly affect staffing patterns and the associated cost structures and explain many of the variations in cost patterns between types of institutions revealed in the charts presented above.

Costs vary by type of institution for some very explainable reasons. These include

- Whether or not the university has medical and/or other programs that prepare health care practitioners (doctors, dentists, veterinarians). These programs are extraordinarily expensive because of the costs associated with individualized training and the clinical experiences required as an essential part of the education program. Faculty in these programs are also highly paid; they can have lucrative careers outside academe.
- The research intensity of the university. Research faculty are generally expected to raise money that pays for the time they spend on research activities as well as for graduate students and others who work in their labs. The more renowned the researcher and the more successful at acquiring grants the higher the salary required to retain the individual; good researchers are hot commodities. The need to pay competitive salaries drives up the cost of their teaching and other non-research related activities.
- The institution's emphasis on science and engineering programs. These programs require expensive laboratory equipment and a support staff to set up, maintain, and teach laboratory sections. In addition, faculty in these disciplines also:
  - Have more access to external research funds
  - Have options for highly-paid jobs in the private sector

As a consequence salaries of faculty in these disciplines tend to be (sometimes significantly) higher than salaries of faculty in disciplines that don't have these circumstances.

- The prevalence of students who need extra help to succeed. While the conditions that increase costs described above tend to be found most often in research universities; this cost driver is found in community colleges and open access four-year institutions. Many students in these types of institutions come to college ill-prepared for college-level work. In order for them to succeed they frequently need extra tutoring or additional student support services. These services drive up the cost of education.

To summarize, data presented in Figures 1 through 15 indicate that

- Colorado institutions have fewer resources to expend on activities designed to fulfill their missions than do similar institutions elsewhere in the country. The limitations are particularly severe at predominantly teaching institutions. (Figures 1-3)
- Colorado institutions spend a large and increasing proportion of their budgets on employee compensation. They spend a larger share on salaries and less on benefits. Two-year institutions spend a smaller share of their available resources on compensation than their national counterparts, likely a consequence of their heavy reliance on part-time faculty (as is revealed in later figures). (Figures 4-6)
- Colorado institutions are spending a decreasing proportion of their budgets on factors other than compensation. They are using an increasing share of their available resources on their key assets – faculty and staff. (Figures 7-9)
- Colorado institutions are more heavily reliant on part-time faculty than national counterparts. The predominantly teaching institutions have fewer full-time faculty than similar institutions elsewhere. The research universities have more, a reflection of their success in acquiring research funds that pay a significant share of the salaries for their faculties. (Figures 10-12)
- Colorado’s research universities have managed to stay more-or-less competitive on faculty salaries, a basic necessity to maintain and improve their track record on research funding. The state’s teaching institutions have been less able in this regard. (Figures 13-15)

To more rigorously examine the determinants of costs in higher education and to put Colorado’s public postsecondary institutions in a broader context, NCHEMS conducted regression analyses to determine what factors explain institutional costs – both in Colorado and for public institutions across the U.S. The regression models enabled us to (1) determine the most significant factors that explain costs, and (2) based on these factors, ascertain whether Colorado’s postsecondary institutions are spending more or less than predicted relative to these factors. The following is purposefully a brief report on our findings, in order to make it as understandable as possible. More detailed questions can always be directed to the staff at NCHEMS. As part of the project, NCHEMS delivered to the Department of Higher Education the detailed analysis and technical guide describing the methodology employed.

The analyses were conducted for all public four-year institutions in the U.S., in order to provide context for the expenditures in Colorado institutions. For this project, we were directed to consider the public two-year system (as opposed to individual community colleges) as the unit of analysis. NCHEMS was not able to run the analyses for public two-year systems in the U.S. because 50 (the number of states) is not enough to produce valid results in statistical models like these. Also, preliminary analyses conducted at the two-year college level (as opposed to systems) did not explain enough variance in costs to produce “predicted vs. actual” comparisons.

While NCHEMS has not conducted comprehensive analyses such as these in the past (and is not aware of any like them), it has been our experience through decades of work with colleges and universities that costs in higher education institutions are largely associated with:

- The number of faculty and staff, and how much they are paid.
- The allocation of faculty and staff to certain activities (what they are assigned to do), which is largely a function of institutional mission.
- The mission of institutions. For example, institutions that are more heavily involved in graduate-level education and research need to hire faculty that are priced more highly in the market.
- The characteristics of the students that institutions serve – their income levels, racial/ethnic composition, and the levels of academic preparation when they enter college.
- The complexity of academic programs offered at institutions. This includes the number of programs offered and the types of programs offered. Some programs are much more expensive than others to operate – e.g. engineering vs. English.

Based on these experiences, NCHEMS set out to determine how well many of these factors – in combination – explain costs in public four-year institutions, and whether Colorado’s institutions are spending more than they should relative to like institutions across the U.S..

The data used for these analyses are from the National Center for Education Statistics (NCES). All U.S. colleges and universities that accept federal Pell Grant recipients are required to report data annually to NCES’ Integrated Postsecondary Education Data System (IPEDS). They report detailed data on institutional characteristics, finance, enrollments, completions, student financial aid, faculty and staff, among other things. To learn more about IPEDS, visit <https://nces.ed.gov/ipeds/>. Also included are some weighting factors for the complexity of programmatic offerings. The State Higher Education Executive Officers conducted a four-state study on costs of program offerings in colleges and universities. The states (and public colleges and universities within them) included Florida, Ohio, Illinois, and Nevada. From the results of this study, different weights were applied to different types and levels of academic programs based on their costs. For example, more expensive programs like engineering and nursing were given more weight than less expensive programs like many of those in the arts and humanities. The number of completers in each program were “cost adjusted” based on these weights.

## Cost-Driver Analyses

There were two analyses conducted to explain costs. The two cost variables are:

1. Total expenditures at public four-year institutions
2. Instructional expenditures at public four-year institutions

The variables used to explain costs were:

1. Median family income of the county in which each institution is located (a factor for cost of living/faculty salaries)
2. Total annual full-time equivalent students
3. Entering ACT and SAT scores (preparation levels of first-time students)
4. Percentage of students who attend part-time
5. Percentage of first-time full-time students receiving federal Pell Grants
6. Percentage undergraduate underrepresented minorities (Hispanic, Black, Native American)



7. Percentage of graduate enrollment
8. Number of undergraduate programs with completers (program breadth)
9. Number of graduate programs with completers
10. Research expenditures per full-time faculty
11. Whether the institution grants a medical degree
12. Whether the institutions has land grant status
13. Percentage of full-time faculty
14. The number of faculty as a percent of all employees
15. Weighted monthly salaries for instructional staff
16. Cost adjusted undergraduate degrees awarded relative to non-weighted undergraduate degrees awarded (cost adjustments were applied to completers in programs in different fields of study – trying to account for more and less expensive program offered at the institutions)
17. Cost adjusted graduate degrees awarded relative to non-weighted graduate degrees awarded (same method as described above)
18. Employee benefits as a percent of total expenditures
19. Physical plant depreciation per full-time equivalent student (the best measure we have for the size of the physical plant)
20. Operation and maintenance expenditures as a percent of total expenditures

## Results of Cost-Driver Analyses

When taking all of the above factors into account, the following variables explained 80 percent of the variance in total institutional expenditures:

- Total annual full-time equivalent students
- Percentage of undergraduate underrepresented minorities (Hispanic, Black, Native American)
- Research expenditures per full-time faculty
- Whether the institution grants a medical degree
- Percentage of full-time faculty
- The number of faculty as a percent of all employees
- Weighted monthly salaries for instructional staff
- Cost adjusted undergraduate degrees awarded relative to non-weighted undergraduate degrees awarded
- Cost adjusted graduate degrees awarded relative to non-weighted graduate degrees awarded
- Employee benefits as a percent of total expenditures
- Physical plant depreciation per full-time equivalent student
- Operation and maintenance expenditures as a percent of total expenditures

In all cases but one the higher the value of these variables, the greater the expenditures at an institution. The exception is that the greater the number of annual full-time equivalent students the lower the overall expenditure.

These findings reinforce the a priori expectations that informed the simple analyses that presented in the earlier part of this document; in other words, institutional mission; faculty-size, full-time/part-time status and pay levels; and physical plant costs explain most of the costs associated with operating a college or university.

When taking all of the above factors into account, the following variables explained 65 percent of the variance instructional institutional expenditures:

- Entering ACT and SAT scores (preparation levels of first-time students)
- Percent undergraduate underrepresented minorities (Hispanic, Black, Native American)
- Percentage of graduate enrollment
- Whether the institution grants a medical degree
- Percent full-time faculty
- The number of faculty as a percent of all employees
- Weighted monthly salaries for instructional staff
- Cost adjusted undergraduate degrees awarded relative to non-weighted undergraduate degrees awarded (cost adjustments were applied to completers in programs in different fields of study – trying to account for more and less expensive program offered at the institutions)
- Cost adjusted graduate degrees awarded relative to non-weighted graduate degrees awarded (same method as described above)
- Employee benefits as a percent of total expenditures
- Physical plant depreciation per full-time equivalent student

From each of the two regression models above, “predicted” values for (1) total expenditures and (2) instructional expenditures were generated for each public four year institution in the U.S. (using the statistical software SPSS, a product of IBM). As a result, all of the *actual* total and instructional expenditures of Colorado’s public four-year institutions are at or below what was predicted by the models – meaning they are not spending more (in total and on instruction) than institutions like them around the country). Below are the actual vs. predicted expenditures for Colorado’s public four-year institutions – by sector. Clearly, universities in Colorado are not spending more than predicted based on the characteristics of the institution and the students they serve. In fact, they are below what is predicted.

**Table 1. Actual Expenditures at Colorado Institutions Compared to Values Predicted by Statistical Analyses**

Expenditures 2012-13	Postsecondary Education Sector	Actual Expenditures	Predicted Expenditures	Difference between Actual and Predicted Expenditures
Total Expenditures	Research Universities	28,075	29,034	(959)
	Bachelor's and Master's Universities	10,466	12,584	(2,117)
Instructional Expenditures	Research Universities	8,946	9,222	(275)
	Bachelor's and Master's Universities	4,320	4,672	(352)

Note: Research Universities include University of Colorado at Boulder, Colorado State – Fort Collins, Colorado School of Mines, and Northern Colorado University. The bachelor’s and master’s institutions include Adams State University, University of Colorado at Colorado Springs, Fort Lewis College, Colorado Mesa University, Metropolitan State University of Denver, Colorado State University – Pueblo, and Western State Colorado University. The University of Colorado-Denver is not included in the above analyses due to the IPEDS data not specifically segregating the four-year CU Denver campus from the CU Anschutz Medical Campus.

NCHEMS was not able to run the analyses for public two-year systems (the Colorado CC system was treated as a whole) in the U.S. because 50 (the number of states) is not enough to produce valid results in statistical models like these. Also, preliminary analyses conducted at the two-year college level (as opposed to systems) did not explain enough variance in costs to produce “predicted vs. actual” comparisons.