Revisions in State Establishment-based Employment Estimates Effective January 2024

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Introduction

With the release of the payroll employment estimates for January 2024 in March 2024, nonfarm payroll employment, hours, and earnings data for states and areas were revised to reflect the incorporation of the 2023 benchmarks and the recalculation of seasonal adjustment factors. The revisions affect all not seasonally adjusted data from April 2022 to December 2023, all seasonally adjusted data from January 2019 to December 2023, and select series subject to historical revisions before April 2022. This article provides background information on benchmarking methods, business birth-death modeling, seasonal adjustment of employment data, and details of the effects of the 2023 benchmark revisions on state and area payroll employment estimates.

Summary of benchmark revisions

The average absolute percentage revision across all states for total nonfarm payroll employment is 0.7 percent for September 2023. For September 2023, the range of the revision for total nonfarm payroll employment across all states is from -1.8 percent to 1.8 percent.

Differences in seasonality exist between the population data and the sample-based data in the nonfarm payroll series. These differences are significant enough that the Current Employment Statistics (CES) program must use a two-step seasonal adjustment process to develop its seasonally adjusted data for states and areas.

Given these differences, the benchmark revisions to the not seasonally adjusted September 2023 estimates are most appropriate to assess the reliability of the estimation process for states and areas since that month is 12 months after the latest population data used with the release of the 2022 benchmark. Over a 12-month period, the seasonal differences between the population and the sample-based data will largely be reconciled in the not seasonally adjusted data.

Benchmark methods

The CES survey, also known as the payroll or establishment survey, is a federal and state cooperative program that provides timely estimates of payroll employment, hours, and earnings for states and areas by sampling the population of employers. Each month, the CES program surveys about 119,000 businesses and government agencies, representing approximately 629,000 individual worksites. In addition, about 1,100 businesses, representing approximately 3,500 individual worksites, are surveyed in Puerto Rico and the U.S. Virgin Islands. Survey responses provide detailed industry-level data on employment and the hours and earnings of employees on nonfarm payrolls for all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and about 450 metropolitan areas and divisions.[1]

As with data from other sample surveys, CES payroll employment estimates are subject to both sampling and nonsampling error. Sampling error is an unavoidable byproduct of forming an inference about a population based on a sample. A larger sample tends to reduce the size of sampling error, while high population variance and employment levels tend to increase it. These factors vary across states and industries. Nonsampling error, by contrast, includes all other sources of statistical errors, including in reporting and processing.

To control for both sampling and nonsampling error, CES payroll employment estimates are benchmarked annually to employment counts from a census of the employer population. These counts are derived primarily from employment data provided in unemployment insurance (UI) tax reports that nearly all

[1] Further information on the sample size for each state is available at https://www.bls.gov/sae/additional-resources/current-employment-statistics-sample-by-state.htm.

employers are required to file with state workforce agencies. The UI tax reports are collected, reviewed, and edited as part of the Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) program.[2] As part of the benchmark process for benchmark year 2023, census-derived employment counts replace CES payroll employment estimates for all 50 states and the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and about 450 metropolitan areas and divisions for the period from April 2022 to September 2023.

UI tax reports are not collected on a timely enough basis to replace CES payroll estimates for the fourth quarter, October 2023 to December 2023. For this period, estimates are revised using the new September 2023 series level derived from the census employment counts. From those levels, new sample-based estimates are developed that incorporate updated business birth-death factors and new or revised CES microdata.[3]

Changes to CES published series

Special notices regarding Colorado and Oregon employment and wages data

The preliminary version of third-quarter 2023 QCEW Colorado data available at the deadline for establishing the CES benchmark levels showed unusual movements. These unusual movements were likely due to the modernization of the Colorado unemployment insurance premiums system.

As a result, for the 2023 benchmark, BLS replaced Colorado's sample-based estimates from April 2022 through June 2023 with administrative data derived from QCEW. BLS calculated employment levels for July 2023 through September 2023 by using the over-the-month percent changes of the estimates for those months. Normal estimation procedures, including using new or revised microdata and updated birth-death factors, were resumed for October 2023 through December 2023. This process was also used for the Colorado metropolitan statistical areas.

The QCEW program continues to review and edit third-quarter data for several weeks after CES receives the initial data for benchmarking and publication. QCEW data are preliminary until the release of their final revision.[4]

Due to a processing issue, noncovered corporate officers employment was not included in universe employment counts for Oregon from April 2022 through December 2023. This noncovered employment category accounts for less than 0.25% of private sector employment in Oregon.[5] The impact on the benchmark levels is negligible. CES will include Oregon noncovered corporate officers employment in the 2024 benchmark.

Any summary statistics for September 2023 and December 2023 revisions, including those in tables 1 and 2 (industry), 4 (areas), exhibit 1, and the appendix, do not include Colorado or metropolitan areas within the state. Benchmark revisions for Colorado for March, September, and December 2023 are presented in table 3 and the appendix but should be interpreted with caution. All summary statistics presented in this article include Oregon or metropolitan areas within the state.

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[2] Further information on the BLS Quarterly Census of Employment and Wages program is available at https://www.bls.gov/cew/.
[3] Further information on the monthly estimation methods of the CES program can be found in the *BLS Handbook of Methods* at https://www.bls.gov/opub/hom/sae/.
[4] More information on revisions to QCEW data is available in the QCEW Handbook of Methods at https://www.bls.gov/opub/hom/cew/presentation.htm#revisions.
[5] More information on noncovered employment is available in the CES State and Area Handbook of Methods at https://www.bls.gov/opub/hom/sae/calculation.htm#noncovered-employment.

Net business birth-death modeling

Sample-based estimates are adjusted each month by a statistical model designed to reduce a primary source of nonsampling error: the inability of the sample to capture employment growth generated by new business formations on a timely basis. There is an unavoidable lag between an establishment opening for business and its appearance in the sample frame. Because new firm births generate a portion of employment growth each month, additional methods are used to estimate this growth.

Earlier research indicated that, while both the business birth and death portions of total employment are generally significant, the net contribution is relatively small and stable. To account for this net birth-death portion of total employment, BLS uses an estimation procedure with two components. The first component excludes employment losses due to business deaths from sample-based estimation to offset the missing employment gains from business births. This is incorporated into the sample-based estimation procedure by simply not reflecting sample units going out of business, but rather imputing to them the same employment trend as the other continuing firms in the sample. This step accounts for most of the birth and death changes to employment.[6]

The second component is an autoregressive integrated moving average (ARIMA) time series model designed to estimate the residual birth-death change to employment not accounted for by the imputation. To develop the history for modeling, the same handling of business deaths as described for the CES monthly estimation is applied to the population data. Establishments that go out of business have employment imputed for them based on the rate of change of the continuing units. The employment associated with continuing units and the employment imputed from deaths are aggregated and compared to actual population levels. The differences between the two series reflect the actual residual of births and deaths over the past 5 years. The historical residuals are converted to month-to-month differences and used as input series to the modeling process. Models for the residual series are then fit and forecasted using X-13ARIMA-SEATS software.[7] The residuals exhibit a seasonal pattern and may be negative for some months. This process is performed at the national level and for each individual state. Finally, differences between forecasts of the nationwide birth-death factors and the sum of the states' birth-death factors are reconciled through a ratio-adjustment procedure, and the factors are used in monthly estimation of payroll employment in 2024. The updated birth-death factors are also used as inputs to produce the revised estimates of payroll employment for October 2023 to December 2023.

Seasonal adjustment

CES state and area payroll employment data are seasonally adjusted by a two-step process.[8] BLS uses the X-13ARIMA-SEATS program to remove the seasonal component of employment time series. This process uses the seasonal trends found in census-derived employment counts to adjust historical benchmark employment data while also incorporating sample-based seasonal trends to adjust sample-based employment estimates. These two series are independently adjusted and then spliced together at the benchmark month (in this case September/October 2023).[9] By accounting for the differing seasonal patterns found in historical benchmark employment data and the sample-based employment estimates, this

[6] Technical information on the estimation methods used to account for employment in business births and deaths is available at https://www.bls.gov/web/empsit/cesbd.htm.

[7] Further information on X-13ARIMA-SEATS is available on the Census Bureau website at https://www.census.gov/data/software/x13as.html.

[8] Research from the Dallas Federal Reserve has shown that CES benchmarked population data exhibits a seasonal pattern different from the sample-based estimates. See Berger, Franklin D. and Keith R. Phillips (1994), "Solving the Mystery of the Disappearing January Blip in State Employment Data," Federal Reserve Bank of Dallas, Economic Review, April, 53-62., available at https://www.dallasfed.org/~/media/documents/research/er/1994/er9402d.pdf.

[9] The two-step seasonal adjustment process is explained in detail by Scott, Stuart; Stamas, George; Sullivan, Thomas; and Paul Chester (1994), "Seasonal Adjustment of Hybrid Economic Time Series," available at https://www.bls.gov/osmr/research-papers/1994/pdf/st940350.pdf.

technique yields improved seasonally adjusted series with respect to analysis of month-to-month employment change.[10]

The aggregation method of seasonally adjusted data is based upon the availability of underlying industry data. For all 50 states, the District of Columbia, and Puerto Rico, the following series are sums of underlying industry data: total private, goods producing, service providing, and private service providing. The same method is applied for the U.S. Virgin Islands except for goods producing and private service providing, which are independently seasonally adjusted because of data limitations. For all 50 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands, data for manufacturing; trade, transportation, and utilities; financial activities; education and health services; leisure and hospitality; and government are aggregates wherever exhaustive industry components are available; otherwise, these industries' employment data are directly seasonally adjusted. In a very limited number of cases, the not seasonally adjusted data for mining and logging; construction; manufacturing; trade, transportation, and utilities; financial activities; education and health services; leisure and hospitality; and government do not exhibit enough seasonality to be adjusted; in those cases, the not seasonally adjusted data are used to sum to higher level industries. The seasonally adjusted total nonfarm data for all metropolitan statistical areas (MSAs) and metropolitan divisions are not calculated through aggregation but are derived directly by applying the seasonal adjustment procedure to the not seasonally adjusted total nonfarm level.[11]

BLS uses concurrent seasonal adjustment for CES state and area data. This method uses all available estimates, including those for the current month, in developing sample-based seasonal factors.[12] Concurrent sample-based seasonal factors are created every month for the current month's preliminary estimates, as well as the previous month's final estimates. Outlier detection is a regular part of the monthly seasonal adjustment process.

Variable survey intervals

BLS uses special model adjustments to control for survey interval variations, sometimes referred to as the 4 vs. 5-week effect, for all nonfarm seasonally adjusted series. Although the CES survey reference period is always the pay period including the 12th day of each month, inconsistencies arise because there are sometimes 4 and sometimes 5 weeks between the weeks including the 12th day in a given pair of months. In highly seasonal industries, these variations can affect the magnitude of seasonal hires or layoffs that have occurred at the time the survey is taken.[13]

Prior adjustments

BLS incorporates prior adjustments as part of the seasonal adjustment process. Unlike the use of seasonal outliers, prior adjustments remove the effect (rounded to hundreds) of a known nonseasonal event from the not seasonally adjusted data before running X-13ARIMA-SEATS. This is done to ensure that nonseasonal events, such as decennial census hiring or strikes, are not included in the calculation of the seasonal factors. Once the seasonal factors are calculated, they are applied to the not seasonally adjusted data used as inputs. Then the prior adjustments that were removed before running X-13ARIMA-SEATS are incorporated to create the seasonally adjusted estimates. Seasonal outliers will continue to be made where there is insufficient information to determine a prior adjustment.

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[10] A list of all seasonally adjusted employment series is available at https://www.bls.gov/sae/additional-resources/list-of-published-state-and-metropolitan-area-series/home.htm.

[11] A list of BLS-published areas is available at https://download.bls.gov/pub/time.series/sm/sm.area.

[12] Technical information on concurrent seasonal adjustment for CES state and area data can be found at https://www.bls.gov/sae/seasonal-adjustment/implementation-of-concurrent-seasonal-adjustment-for-ces-state-and-area-estimates.htm.

[13] More information on the presence and treatment of calendar effects in CES data is explained by Cano, Stephanie; Getz, Patricia; Kropf, Jurgen; Scott, Stuart; and George Stamas (1996), "Adjusting for a Calendar Effect in Employment Time Series," available at https://www.bls.gov/osmr/research-papers/1996/pdf/st960190.pdf.

Outlier detection in seasonal adjustment

Outlier detection is a regular part of the monthly seasonal adjustment process. When performing outlier detection, BLS uses a rule where, for all time series, data points over a certain critical value are designated as outliers.[14]

Implementation of weight smoothing

Effective with the release of January 2024 estimates on March 11, 2024, CES implemented a weight smoothing procedure for statewide modeled series and all series in the metropolitan areas, with a few exceptions. Weight smoothing alters the original sample design weights for a given series by utilizing the relationship between the sample design weight and the over-the-month change, finding expected weights for each sample unit in the series. Overall, weight smoothing has been shown to provide a notable reduction in benchmark revisions, lower month-to-month estimate volatility, and an increase in accuracy given the available series sample size.[15]

Benchmark revisions

Revisions by industry

As noted earlier, the average absolute percentage revision across all states for total nonfarm payroll employment is 0.7 percent for September 2023. For September 2023, the range of the revision for total nonfarm payroll employment across all states is from -1.8 percent to 1.8 percent. (See table 1.)

Historical and current benchmark revisions for March and current revisions for December at both the state and industry level are included in the appendix.

Absolute level revisions provide further insight on the magnitude of benchmark revisions. Absolute level revisions are measured as the absolute difference between the sample-based estimates of payroll employment and the benchmark levels of payroll employment for September 2023. A relatively large benchmark revision in terms of percentage can correspond to a relatively small benchmark revision in terms of level due to the amount of employment in the industry.

[14] For a list of outliers identified during the concurrent seasonal adjustment process, see https://www.bls.gov/sae/seasonal-adjustment/#outliers.

[15] More information on the weight smoothing methodology is detailed in the paper "On Weight Smoothing in the Current Employment Statistics Survey" by Julie Gershunskaya and Michael Sverchkov, available at https://www.bls.gov/osmr/research-papers/2014/pdf/st140140.pdf.

Table 1. Average absolute percentage differences between state employment estimates and benchmarks by industry, not seasonally adjusted, September 2018–September 2023 (all values in percent)

Industry[1]	Sep. 2018[2]	Sep. 2019	Sep. 2020	Sep. 2021	Sep. 2022	Sep. 2023[3]
Total nonfarm	0.6	0.5	1.1	0.9	0.7	0.7
Mining and logging	4.0	4.7	7.7	4.5	4.0	4.4
Construction	3.0	2.9	3.5	3.1	3.2	2.6
Manufacturing	1.5	1.4	2.8	1.8	1.7	1.7
Trade, transportation, and utilities	1.2	1.2	2.1	1.1	1.6	0.9
Information	2.4	2.8	4.1	5.0	3.8	4.9
Financial activities	2.1	1.6	2.5	1.9	2.6	2.2
Professional and business services	1.5	1.9	2.5	2.4	2.2	2.5
Education and health services	0.8	1.2	1.6	1.7	1.3	1.5
Leisure and hospitality	1.7	1.6	5.2	3.4	2.0	1.6
Other services	4.9	1.9	5.3	3.5	2.9	3.7
Government	1.1	1.0	1.5	1.0	0.8	0.9
Total nonfarm:						
Range	-3.2 to 1.0	-2.1 to 0.9	-4.4 to 3.4	-1.2 to 3.4	-2.0 to 3.1	-1.8 to 1.8
Mean	-0.5	-0.3	-0.5	0.7	0.4	-0.1
Standard deviation	0.7	0.6	1.4	1.0	0.8	0.8

[1] Industry summary statistics are only representative of data for those states where the industry is published at the statewide level. Benchmark data for Puerto Rico and the U.S. Virgin Islands are not included in these summary statistics.
[2] These summary statistics do not include revisions for South Carolina. See the changes to CES published series section in the 2019 benchmark article for more information.
[3] These summary statistics do not include revisions for Colorado. See the changes to CES published series section above for more information.

The following example demonstrates the necessity of considering both percentage revision and level revision when evaluating the magnitude of a benchmark revision in an industry. The average absolute percentage benchmark revisions across all states for information and for professional and business services are 4.9 percent and 2.5 percent, respectively, for September 2023. However, for the same month, the average absolute level revision across all states for the information industry is 2,500, while the average absolute level revision across all states for the professional and business services industry is 9,800. (See table 2.) Relying on a single measure to characterize the magnitude of benchmark revisions in an industry can lead to an incomplete interpretation.

Table 2. Average absolute level differences between state employment estimates and benchmarks by industry, not seasonally adjusted, September 2018–September 2023 (all values payroll employment)

Industry[1]	Sep. 2018[2]	Sep. 2019	Sep. 2020	Sep. 2021	Sep. 2022	Sep. 2023[3]
Total nonfarm	13,400	13,400	27,400	24,700	16,600	20,200
Mining and logging	600	700	1,100	700	600	600
Construction	3,400	3,100	3,500	3,600	3,400	4,000
Manufacturing	2,700	2,900	4,400	3,100	3,600	2,700
Trade, transportation, and utilities	6,600	4,700	7,700	5,400	6,400	5,700
Information	1,100	1,300	1,600	2,200	1,700	2,500
Financial activities	2,100	1,900	3,100	3,200	3,500	4,200
Professional and business services	5,000	5,900	7,700	6,400	9,400	9,800
Education and health services	2,700	4,700	5,600	6,600	4,400	6,300
Leisure and hospitality	4,600	4,500	13,300	9,900	5,700	4,400
Other services	3,100	1,800	5,100	3,100	2,700	3,500
Government	5,200	3,400	4,600	3,900	3,400	3,800
Total nonfarm:						
Range	-101,600 to 21,000	-85,200 to 37,300	-148,000 to 63,400	-31,600 to 221,300	-18,800 to 108,400	-273,000 to 34,200
Mean	-11,300	-8,100	-15,400	20,300	11,800	-11,600
Standard deviation	20,000	21,500	39,300	44,600	21,600	43,400

[1] Industry summary statistics are only representative of data for those states where the industry is published at the statewide level. Benchmark data for Puerto Rico and the U.S. Virgin Islands are not included in these summary statistics

[2] These summary statistics do not include revisions for South Carolina. See the changes to CES published series section in the 2019 benchmark article for more information.

[3] These summary statistics do not include revisions for Colorado. See the changes to CES published series section above for more information.

Revisions by state

For September 2023, nonfarm payroll employment was revised upward in 22 states and downward in 28 states and the District of Columbia. (See table 3 or map 1.)

Table 3. Percent differences between nonfarm payroll employment benchmarks and estimates by state, not seasonally adjusted, September 2018–September 2023 (all values in percent)

State	Sep. 2018	Sep. 2019	Sep. 2020	Sep. 2021	Sep. 2022	Sep. 2023
Alabama	-0.2	-1.0	-1.4	-0.2	1.3	0.7
Alaska	0.4	0.1	-1.2	1.8	0.1	1.8
Arizona	(1)	0.3	-1.1	0.2	0.4	1.1
Arkansas	0.8	-0.5	0.8	1.3	1.8	-0.6
California	(1)	-0.5	-0.9	1.3	0.6	-1.5
Colorado	-0.4	0.2	-1.2	0.9	-0.6	1.4[3]
Connecticut	-0.3	-0.7	-1.0	0.7	0.2	(1)
Delaware	-0.2	-0.7	3.4	(1)	2.6	-0.4
District of Columbia	-0.4	-0.2	-2.0	0.3	-0.1	-1.8
Florida	(1)	-0.9	-1.1	1.7	0.2	-0.1
Georgia	-0.2	-0.2	-2.0	0.4	0.1	-0.4
Hawaii	-1.3	-1.0	-4.4	2.8	1.2	-0.6
Idaho	0.3	0.2	0.5	2.0	0.8	-0.9
Illinois	0.1	-1.2	-0.9	0.4	-0.3	-0.7
Indiana	0.2	-0.1	-1.5	0.9	0.4	-0.9
Iowa	-0.3	-0.5	0.1	-0.1	-0.7	0.4
Kansas	-0.5	-1.1	-0.8	-1.2	1.3	-0.3
Kentucky	-0.1	-1.0	0.7	1.1	0.3	-0.3
Louisiana	-0.3	-0.4	-3.1	0.9	-0.3	-1.0
Maine	-0.2	0.6	2.1	1.5	-0.1	0.1
Maryland	-0.4	(1)	-1.6	-0.4	-0.7	-0.6
Massachusetts	-1.1	(1)	-0.2	0.6	-0.4	-1.8
Michigan	-0.3	-0.4	1.5	0.9	0.3	0.6
Minnesota	-0.6	0.5	-0.4	-0.9	0.3	-0.1
Mississippi	-0.9	-1.0	-1.0	0.4	1.7	0.9
Missouri	-0.8	-0.7	-0.2	0.1	0.5	-0.1
Montana	-0.3	0.1	0.8	2.8	1.2	0.3
Nebraska	-0.9	-0.7	-1.0	-1.2	-0.5	0.7
Nevada	(1)	-1.0	-3.0	3.4	3.1	-0.8
New Hampshire	-1.6	-0.8	2.0	0.9	0.9	-0.1
New Jersey	-0.9	0.2	-0.6	1.4	0.4	-0.2
New Mexico	-1.2	-0.1	-2.1	1.0	0.2	0.5
New York	0.2	-0.1	-0.5	1.7	0.6	0.1
North Carolina	-0.8	(1)	1.2	1.7	0.4	0.2
North Dakota	-0.1	0.6	-0.2	0.4	-0.1	0.1
Ohio	-1.3	-0.3	1.2	0.1	0.8	-0.6
Oklahoma	-0.3	0.7	-0.8	-0.2	1.2	1.6
Oregon	-0.7	-0.3	(1)	0.4	-0.9	-1.3
Pennsylvania	-0.5	0.3	(1)	0.6	0.4	-1.0
Rhode Island	-1.3	(1)	-1.0	0.7	-0.1	1.8
South Carolina	0.8[2]	0.7	-1.5	-0.1	0.8	0.4
South Dakota	-0.7	-1.5	0.2	1.4	0.1	-0.4
Tennessee	-0.1	0.3	-0.2	0.8	0.4	-0.6
Texas	-0.8	-0.2	-1.1	(1)	0.4	-0.5
Utah	0.1	-0.3	-1.2	-0.1	0.9	0.4
Vermont	1.0	-0.1	0.8	0.5	0.5	0.5
Virginia	-0.7	0.9	-0.4	0.4	0.3	0.5
Washington	-0.9	-0.6	-0.7	-0.9	0.6	-0.9
West Virginia	-3.2	-2.1	0.3	-0.2	-2.0	1.0
Wisconsin	-0.5	-0.3	1.7	0.3	0.9	-0.1
Wyoming	-0.9	0.3	-0.6	1.7	-0.2	-0.3

(1) Less than +/- 0.05 percent

[2] Revisions for South Carolina are included in this table. Users are cautioned given the unusual movements in the South Carolina QCEW data. See the changes to CES published series section in the 2019 benchmark article for more information.
[3] Revisions for Colorado are included in this table. Users are cautioned given the unusual movements in the Colorado QCEW data. See the changes to CES published series section above for more information.

The distribution of percent revisions for March 2023, September 2023, and December 2023 can be found in exhibit 1. Quintiles are representative of 20 percent of the range of state benchmark revisions. For example, 20 percent of the revisions are -0.8 or less for September 2023 while 100 percent of the revisions are equal to or less than 1.8 percent.

Exhibit 1. Distribution of state percent revisions, March 2023, September 2023, and December 2023 (all values in percent)

Percentiles of Percent Revisions	March 2023	September 2023[2]	December 2023[2]
20th percentile.....	-0.4	-0.8	-0.7
40th percentile.....	(1)	-0.4	-0.3
60th percentile.....	0.2	(1)	(1)
80th percentile.....	0.5	0.5	0.6
100th percentile.....	1.5	1.8	1.8

(1) Less than +/- 0.05 percent
[2] These summary statistics do not include revisions for Colorado. See the changes to CES published series section above for more information.

Revisions by metropolitan statistical area

For all MSAs published by the CES program, excluding the MSAs in Colorado, the total nonfarm percentage revision for September 2023 ranged from -6.2 percent to 6.2 percent, with an average absolute percentage revision of 1.4 percent across all published MSAs. (See table 4.) For comparison, at the statewide level, the range was from -1.8 percent to 1.8 percent, with an average absolute revision of 0.7 percent for September 2023. (See table 1.) In general, both the range of percentage revisions and the average absolute percentage revision increase as the amount of employment in an MSA decreases. Metropolitan areas with 1 million or more employees during September 2023 had an average absolute revision of 0.9 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 1.6 percent. (See table 4.)

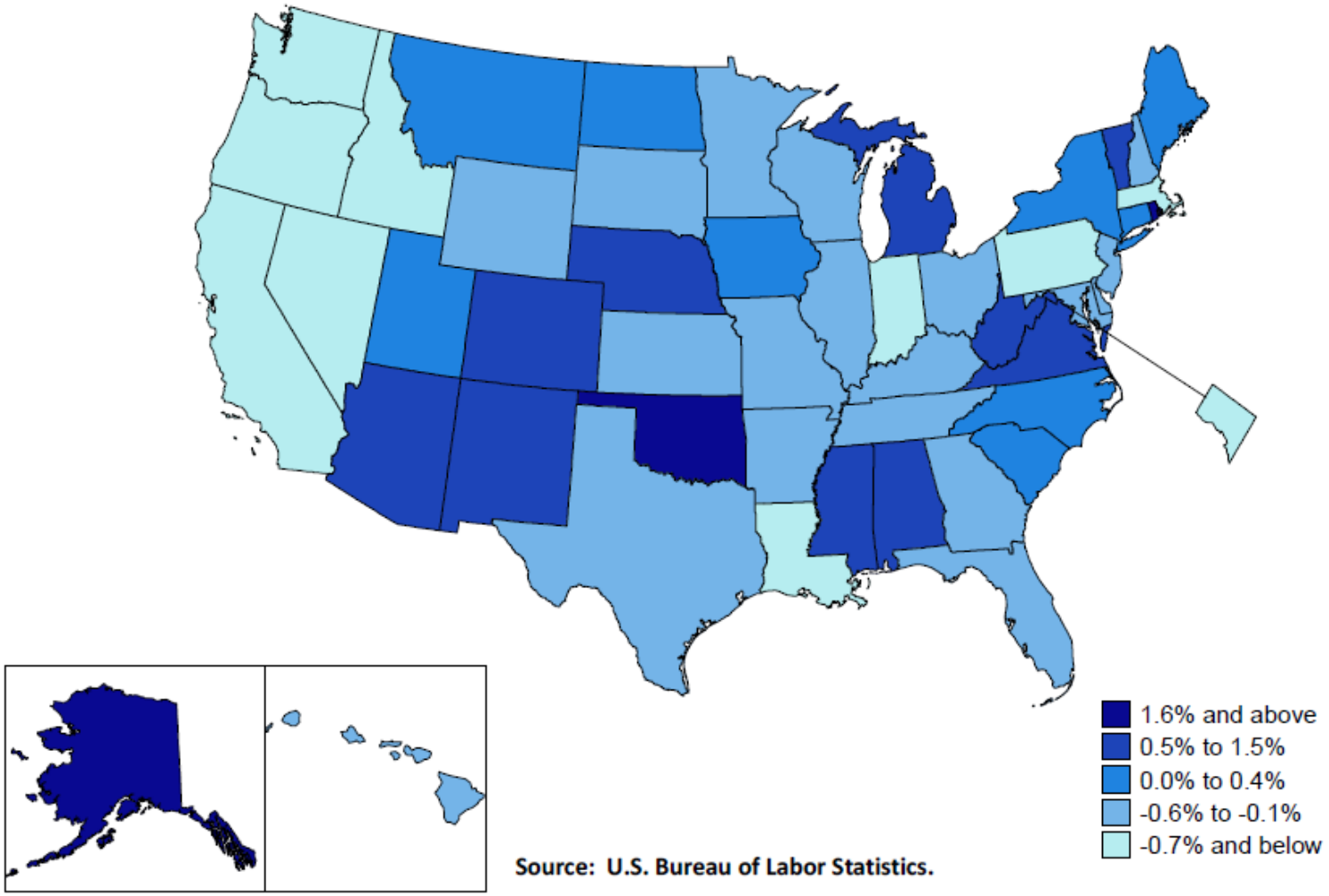
Table 1. Benchmark revisions for nonfarm employment in metropolitan areas for September 2023, not seasonally adjusted

Measure[2]	All MSAs	MSAs grouped by level of total nonfarm employment			
		Less than 100,000	100,000 to 499,999	500,000 to 999,999	1 million or more
Number of MSAs……..	382	182	148	17	35
Average absolute percentage revision……..	1.4	1.6	1.3	0.8	0.9
Range…….	-6.2 to 6.2	-6.2 to 6.2	-5.6 to 5.5	-2.2 to 1.8	-2.5 to 1.7
Mean.....	-0.1	-0.1	-0.1	(1)	-0.6
Standard deviation…….....	1.8	2.1	1.6	1.1	1.1

(1) Less than +/- 0.05 percent

[2] These summary statistics do not include revisions for Colorado. See the changes to CES published series section above for more information.

Map 1. Percent differences between nonfarm payroll employment benchmarks and estimates by State, September 2023



Source: U.S. Bureau of Labor Statistics.

Appendix

Table A1. Average absolute percentage differences between state employment estimates and benchmarks by industry, not seasonally adjusted, March 2018–March 2023 and December 2023 (all values in percent)

Industry[1]	Mar. 2018[2]	Mar. 2019	Mar. 2020	Mar. 2021	Mar. 2022	Mar. 2023	Dec. 2023[3]
Total nonfarm	0.4	0.4	0.5	0.8	0.7	0.5	0.6
Mining and logging	3.6	3.4	4.1	4.1	4.1	4.1	4.5
Construction	2.1	3.5	2.2	2.6	2.6	2.4	2.6
Manufacturing	1.2	1.3	1.3	1.3	1.5	1.2	1.6
Trade, transportation, and utilities	1.0	0.8	0.9	1.1	1.1	0.8	0.9
Information	2.2	2.3	3.0	3.8	3.5	2.8	4.8
Financial activities	1.5	1.5	1.4	1.6	1.9	2.0	2.2
Professional and business services	1.3	1.6	1.3	1.9	2.2	1.6	2.4
Education and health services	0.8	1.0	1.1	1.5	1.1	1.2	1.6
Leisure and hospitality	1.3	1.3	1.8	2.0	1.6	1.4	1.8
Other services	4.4	1.8	2.2	2.9	2.2	2.7	3.7
Government	0.8	0.6	0.7	0.7	0.7	0.6	1.0
Total nonfarm:							
Range	-4.4 to 1.4	-2.1 to 1.7	-1.0 to 2.1	-0.7 to 2.0	-0.6 to 3.0	-1.3 to 1.5	-2.1 to 1.8
Mean	-0.1	0.1	0.3	0.7	0.6	0.1	-0.1
Standard deviation	0.8	0.6	0.6	0.7	0.7	0.6	0.8

[1] Industry summary statistics are only representative of data for those states where the industry is published at the statewide level. Benchmark data for Puerto Rico and the U.S. Virgin Islands are not included in these summary statistics.
[2] These summary statistics do not include revisions for South Carolina. See the changes to CES published series section in the 2019 benchmark article for more information.
[3] These summary statistics do not include revisions for Colorado. See the changes to CES published series section above for more information.

Table A2. Average absolute level differences between state employment estimates and benchmarks by industry, not seasonally adjusted, March 2018–March 2023 and December 2023 (all values payroll employment)

Industry[1]	Mar. 2018[2]	Mar. 2019	Mar. 2020	Mar. 2021	Mar. 2022	Mar. 2023	Dec. 2023[3]
Total nonfarm	9,200	8,200	12,900	23,900	17,700	13,600	20,100
Mining and logging	300	300	400	500	400	300	600
Construction	2,300	2,900	2,500	2,600	2,800	3,100	3,900
Manufacturing	1,900	2,100	2,200	2,200	2,700	2,000	2,600
Trade, transportation, and utilities	4,900	3,100	3,500	5,400	4,900	4,900	5,600
Information	1,200	1,200	1,200	1,500	1,600	1,300	2,500
Financial activities	1,500	2,000	2,100	2,600	2,800	3,100	4,200
Professional and business services	4,000	4,100	4,600	6,000	8,700	6,200	9,400
Education and health services	3,100	3,800	4,300	6,000	4,100	3,900	6,700
Leisure and hospitality	3,000	2,600	5,100	4,600	4,100	3,500	4,900
Other services	2,400	1,500	2,700	2,500	1,800	3,000	3,600
Government	3,400	2,100	2,800	2,900	2,500	2,200	4,200
Total nonfarm:							
Range	-37,600 to 66,500	-35,200 to 30,400	-29,100 to 92,200	-34,500 to 193,700	-11,300 to 143,000	-192,700 to 37,000	-243,400 to 35,300
Mean	1,200	1,900	8,100	20,400	16,400	-1,000	-9,800
Standard deviation	16,200	11,400	18,700	38,900	25,400	30,500	41,200

[1] Industry summary statistics are only representative of data for those states where the industry is published at the statewide level. Benchmark data for Puerto Rico and the U.S. Virgin Islands are not included in these summary statistics

[2] These summary statistics do not include revisions for South Carolina. See the changes to CES published series section in the 2019 benchmark article for more information.

[3] These summary statistics do not include revisions for Colorado. See the changes to CES published series section above for more information.

Table A3. Percent differences between nonfarm payroll employment benchmarks and estimates by state, not seasonally adjusted, March 2018–March 2023 and December 2023 (all values in percent)

State	Mar. 2018	Mar. 2019	Mar. 2020	Mar. 2021	Mar. 2022	Mar. 2023	Dec. 2023
Alabama	0.2	-0.2	-0.2	0.2	1.2	0.6	0.5
Alaska	-0.4	-0.6	0.6	1.1	0.5	-0.4	1.2
Arizona	0.4	0.4	0.2	0.8	1.6	1.2	1.1
Arkansas	1.4	0.5	1.4	0.9	1.3	-0.1	-0.4
California	0.3	(1)	0.5	1.2	0.8	-1.1	-1.3
Colorado	-0.2	0.1	0.2	0.8	0.1	0.9	1.7[3]
Connecticut	-0.2	-0.5	0.3	0.9	1.0	0.2	(1)
Delaware	0.3	0.5	-0.1	0.8	3.0	0.2	(1)
District of Columbia	-0.1	0.3	-0.1	-0.6	-0.1	-0.8	-1.8
Florida	(1)	-0.1	0.3	2.0	0.4	0.1	(1)
Georgia	0.3	0.1	0.5	0.5	(1)	0.2	-0.5
Hawaii	-0.7	-0.1	0.1	2.0	1.5	0.2	-0.2
Idaho	-0.1	0.4	1.0	0.3	1.3	-1.3	-0.8
Illinois	0.4	-0.6	0.6	0.6	0.1	0.1	-0.6
Indiana	0.6	0.1	-0.3	0.9	-0.1	-0.3	-0.9
Iowa	-0.2	-0.1	0.8	0.6	0.5	-0.1	0.5
Kansas	-0.4	(1)	-0.1	-0.5	0.7	-0.2	-0.2
Kentucky	0.2	-0.4	0.9	1.6	0.9	0.7	0.1
Louisiana	0.2	0.5	0.5	1.4	(1)	0.3	-1.3
Maine	0.4	0.7	1.1	1.7	0.2	0.6	-0.3
Maryland	0.4	0.3	-0.8	-0.5	-0.4	0.2	-0.7
Massachusetts	0.2	0.7	0.9	1.1	0.3	-1.0	-2.1
Michigan	-0.1	-0.1	-0.2	0.5	0.3	0.5	0.8
Minnesota	(1)	0.5	0.8	0.8	0.4	0.2	-0.3
Mississippi	-1.1	-0.4	(1)	0.5	0.3	0.5	1.1
Missouri	-0.4	-0.3	1.1	0.2	-0.1	-0.2	-0.1
Montana	0.1	0.2	(1)	1.4	0.6	0.2	0.3
Nebraska	-0.3	-0.1	-0.2	-0.6	-0.5	-0.3	0.7
Nevada	0.4	-0.5	2.1	1.0	2.0	-1.3	-0.4
New Hampshire	-0.2	0.2	0.5	0.2	0.7	-0.4	(1)
New Jersey	-0.9	(1)	0.8	1.5	1.4	0.1	-0.1
New Mexico	0.1	0.3	-0.4	1.0	-0.5	0.3	0.6
New York	0.7	0.3	0.1	0.8	0.8	-0.1	0.2
North Carolina	(1)	0.5	0.8	1.3	0.7	0.4	0.4
North Dakota	1.2	1.2	(1)	-0.3	-0.1	0.4	(1)
Ohio	-0.5	-0.1	0.3	0.7	0.8	0.3	-0.6
Oklahoma	0.1	0.7	0.5	0.8	0.5	1.3	1.5
Oregon	(1)	-0.1	0.7	0.9	(1)	-0.3	-1.1
Pennsylvania	(1)	0.3	0.2	0.7	0.9	-0.3	-1.1
Rhode Island	-0.6	1.7	1.0	1.8	0.6	1.4	1.8
South Carolina	0.8[2]	0.2	-0.7	0.5	1.2	0.4	0.4
South Dakota	-0.3	-1.6	-0.1	0.2	1.2	(1)	(1)
Tennessee	-0.1	0.4	-0.3	0.6	0.4	0.1	-0.5
Texas	-0.3	0.2	-0.2	-0.3	0.2	0.1	-0.5
Utah	-0.1	-0.3	-1.0	0.5	0.6	-0.2	0.6
Vermont	-0.1	0.6	0.6	-0.4	1.4	1.2	1.0
Virginia	0.2	0.4	(1)	0.6	0.3	0.5	0.8
Washington	-0.2	-0.7	-0.1	-0.7	0.8	-1.0	-0.6
West Virginia	-4.4	-2.1	0.3	(1)	-0.4	1.5	0.9
Wisconsin	0.2	0.1	0.3	0.7	1.1	0.5	(1)
Wyoming	-0.1	0.1	0.3	0.7	-0.6	0.1	-1.5

(1) Less than +/- 0.05 percent

[2] Revisions for South Carolina are included in this table. Users are cautioned given the unusual movements in the South Carolina QCEW data. See the changes to CES published series section in the 2019 benchmark article for more information.
[3] Revisions for Colorado are included in this table. Users are cautioned given the unusual movements in the Colorado QCEW data. See the changes to CES published series section above for more information.

Table A4. Benchmark revisions for nonfarm employment in metropolitan areas for March 2023, not seasonally adjusted

Measure[1]	All MSAs	MSAs grouped by level of total nonfarm employment			
		Less than 100,000	100,000 to 499,999	500,000 to 999,999	1 million or more
Number of MSAs…….	389	184	152	17	36
Average absolute percentage revision…….	1.1	1.3	1.1	0.8	0.7
Range……	-5.2 to 5.9	-4.9 to 5.0	-5.2 to 5.9	-1.7 to 1.4	-1.9 to 1.4
Mean….....	-0.1	-0.1	-0.1	0.2	-0.2
Standard deviation…….....	1.5	1.6	1.4	0.9	0.9

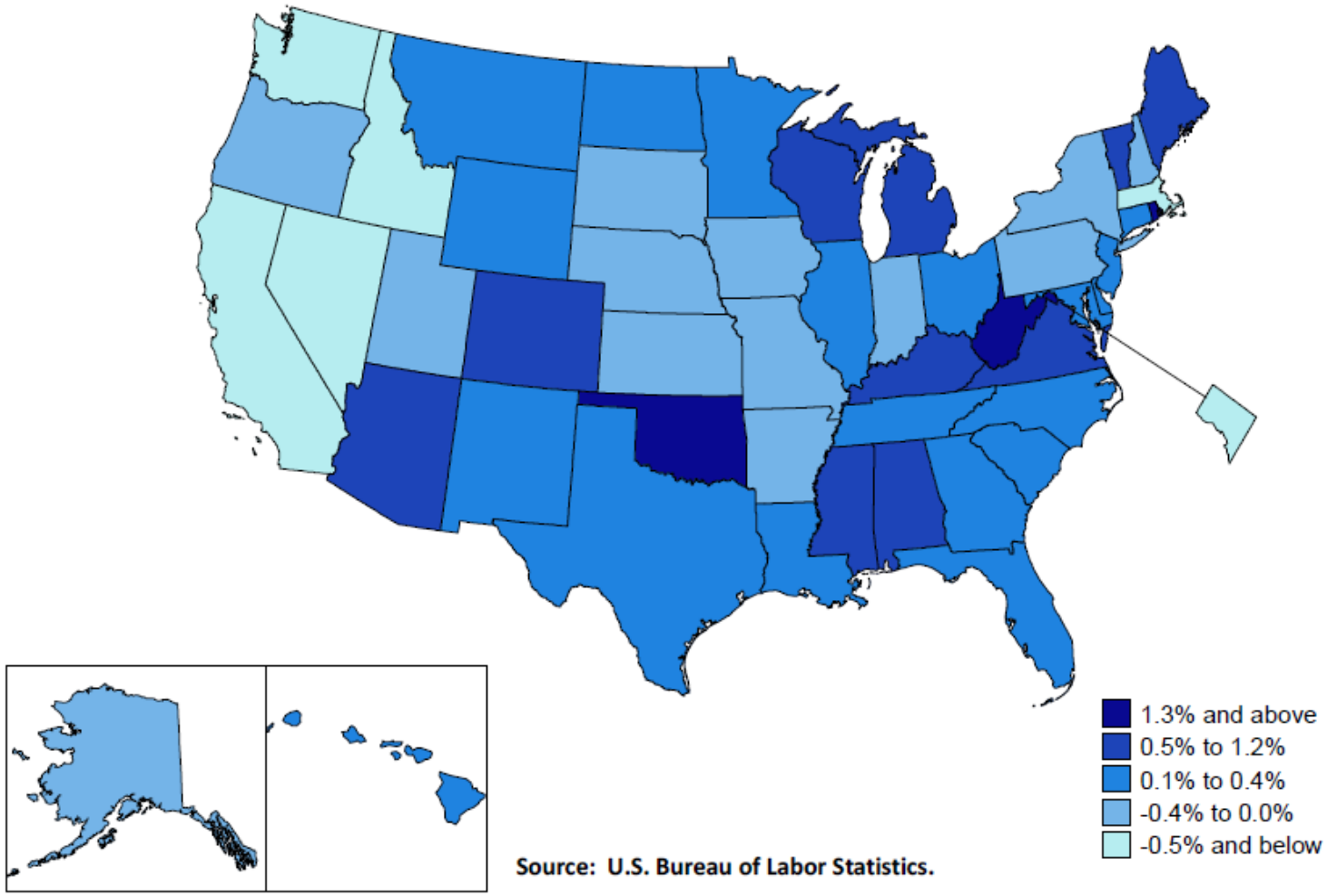
[1] These summary statistics include revisions for Colorado, since the data for Colorado and the metropolitan areas in Colorado were benchmarked using normal methods through June 2023. See the changes to CES published series section above for more information.

Table A5. Benchmark revisions for nonfarm employment in metropolitan areas for December 2023, not seasonally adjusted

Measure[2]	All MSAs	MSAs grouped by level of total nonfarm employment			
		Less than 100,000	100,000 to 499,999	500,000 to 999,999	1 million or more
Number of MSAs……..	382	182	148	17	35
Average absolute percentage revision……..	1.4	1.7	1.3	1.0	1.0
Range…….	-7.6 to 6.5	-7.6 to 6.5	-5.6 to 5.6	-2.4 to 1.9	-2.7 to 1.9
Mean.....	(1)	0.1	-0.1	(1)	-0.5
Standard deviation…….....	1.9	2.2	1.7	1.3	1.2

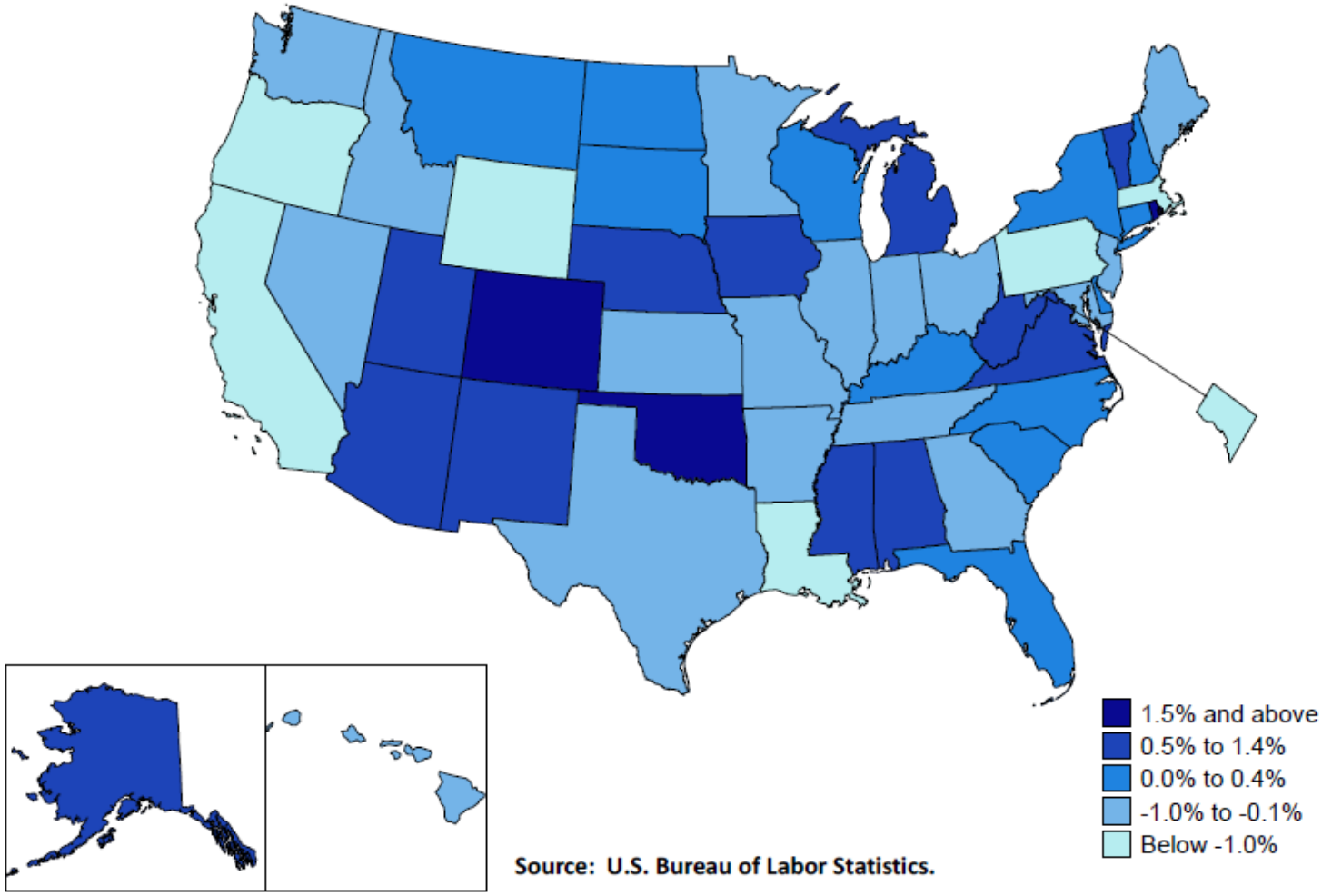
(1) Less than +/- 0.05 percent
[2] These summary statistics do not include revisions for Colorado. See the changes to CES published series section above for more information.

Map A1. Percent differences between nonfarm payroll employment benchmarks and estimates by State, March 2023



Source: U.S. Bureau of Labor Statistics.

Map A2. Percent differences between nonfarm payroll employment benchmarks and estimates by State, December 2023



Source: U.S. Bureau of Labor Statistics.

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Additional information

Historical state and area employment, hours, and earnings data are available on the BLS website at https://www.bls.gov/sae. Inquiries for additional information on the methods or estimates derived from the CES survey should be sent by email to ***sminfo@bls.gov***. Assistance and response to inquiries by telephone is available Monday through Friday, during the hours of 8:30 am to 4:30 pm Eastern Time, by dialing (202) 691-6559.

Previously released benchmark articles for CES state and area data are available at https://www.bls.gov/sae/publications/benchmark-article/home.htm.