

Revisions in State Establishment-based Employment Estimates Effective January 2023

Deepa Acharya, Nicolas LoMurro, and Emma Sillman

Introduction.....	2
Summary of benchmark revisions	2
Benchmark methods.....	2
Changes to CES published series.....	3
<i>Conversion to the 2022 North American Industry Classification System (NAICS)</i>	3
Net business birth-death modeling.....	6
Seasonal adjustment.....	7
<i>Variable survey intervals</i>	8
<i>Prior adjustments</i>	8
<i>Outlier detection in seasonal adjustment</i>	8
Benchmark revisions.....	8
Revisions by industry.....	8
Revisions by state	10
Revisions by metropolitan statistical area.....	12
Appendix.....	14
Table of figures	20
Tables.....	20
Exhibits	20
Maps.....	20
Additional information.....	20

Introduction

With the release of the payroll employment estimates for January 2023 in March 2023, nonfarm payroll employment, hours, and earnings data for states and areas were revised to reflect the incorporation of the 2022 benchmarks and the recalculation of seasonal adjustment factors. The revisions affect all not seasonally adjusted data from April 2021 to December 2022, all seasonally adjusted data from January 2018 to December 2022,¹ and select series subject to historical revisions before April 2021. This article provides background information on benchmarking methods, business birth-death modeling, seasonal adjustment of employment data, and details of the effects of the 2022 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 2022. For September 2022, the range of the revision for total nonfarm payroll employment across all states is from -2.0 percent to 3.1 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 2022 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 2021 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 program, also known as the payroll 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 122,000 businesses and government agencies, representing approximately 666,000 individual worksites. In addition, about 1,000 businesses representing approximately 4,000 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.²

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.

¹ Further information regarding the difference in historical reconstruction between not seasonally adjusted data and seasonally adjusted data is available in the seasonal adjustment section of this article and at <https://www.bls.gov/sae/overview.htm>.

² 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>.

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 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.³ As part of the benchmark process for benchmark year 2022, 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 2021 to September 2022.

UI tax reports are not collected on a timely enough basis to replace CES payroll estimates for the fourth quarter, October 2022 to December 2022. For this period, estimates are revised using the new September 2022 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.⁴

Changes to CES published series

Conversion to the 2022 North American Industry Classification System (NAICS)

With the release of January 2023 data on March 13, 2023, the CES survey updated the basis for industry classification to the 2022 North American Industry Classification System (NAICS) from the NAICS 2017 basis.⁵

Implementation of NAICS 2022 resulted in revisions reflecting content and coding changes within the retail trade, information, and financial services sectors for CES state and area estimates. Total nonfarm employment is not affected in any state or metropolitan area due to the NAICS revision. Some of the changes associated with the NAICS 2022 update affected levels of detail not published by CES at the state and metropolitan area level; therefore, only cases where CES industries are affected are discussed in detail here.⁶

The conversion from NAICS 2017 to NAICS 2022 affected CES industry codes in several ways. Some CES series were converted as a whole from their NAICS 2017 industry code to their new NAICS 2022 industry code. For example, NAICS 2022 series code 50517311 (Wired Telecommunications Carriers) was derived wholly from NAICS 2017 code 50517111 (Wired Telecommunications Carriers). For other NAICS 2017 industry codes, employment was partially distributed to multiple new NAICS 2022 industry codes. For instance, NAICS 2017 series code 42454100 was split into multiple series codes for NAICS 2022. The effect of the reclassification from NAICS 2017 to NAICS 2022 for CES state and area estimates is detailed in Exhibit 1.⁷

Due to the implementation of NAICS 2022, several hours and earnings series were modified or added for publication. Modified series previously existed in CES publications but were updated with a slightly new

³ Further information on the BLS Quarterly Census of Employment and Wages program is available at <https://www.bls.gov/cew/>.

⁴ Further information on the monthly estimation methods of the CES program can be found in the *BLS Handbook of Methods* and is available at <https://www.bls.gov/opub/hom/sae/>.

⁵ Further information about the NAICS 2017 and the NAICS 2022 classification systems can be found at the Census Bureau's NAICS page at <https://www.census.gov/naics/>.

⁶ Further information on NAICS codes and CES industry codes, as well as previous NAICS conversions, is available at <https://www.bls.gov/sae/additional-resources/details-on-the-conversion-to-the-2022-north-american-industry-classification-system-naics-from-2017-naics.htm>.

⁷ Further information on the effect of the NAICS 2022 update to CES National can be found in the CES National benchmark article at <https://www.bls.gov/web/empsit/cesbmart.htm>.

mix of 6-digit NAICS industries. Histories were created back to 2011 for each affected hours and earnings series.

Exhibit 1. CES Series Reclassifications from NAICS 2017 to NAICS 2022

NAICS 2017		NAICS 2022	
Series Code	CES Series Title	Series Code	CES Series Title
31339000	Miscellaneous Durable Goods Manufacturing	31339000	Miscellaneous Manufacturing (title change only)
41425000	Wholesale Electronic Markets and Agents and Brokers	41425000	Wholesale Trade Agents and Brokers (title change only)
42441300	Automotive Parts, Accessories, and Tire Stores	42441300	Automotive Parts, Accessories, and Tire Retailers (1)
42442000	Furniture and Home Furnishings Stores	42449000	Furniture, Home Furnishings, Electronics, and Appliance Retailers (1)(2)
42442000	Furniture and Home Furnishings Stores	42449100	Furniture and Home Furnishings Retailers (1)
42442100	Furniture Stores	42449110	Furniture Retailers (1)
42442200	Home Furnishings Stores	42449120	Home Furnishings Retailers (1)
42443000	Electronics and Appliance Stores	42449000	Furniture, Home Furnishings, Electronics, and Appliance Retailers (1)(2)
42443000	Electronics and Appliance Stores	42449200	Electronics and Appliance Retailers (1)
42445000	Food and Beverage Stores	42445000	Food and Beverage Retailers (1)
42445100	Grocery Stores	42445100	Grocery and Convenience Retailers (1)
42445200	Specialty Food Stores	42445200	Specialty Food Retailers (1)
42445300	Beer, Wine, and Liquor Stores	42445300	Beer, Wine, and Liquor Retailers (1)
42446000	Health and Personal Care Stores	42456000	Health and Personal Care Retailers (1)
42447000	Gasoline Stations	42457000	Gasoline Stations and Fuel Dealers (1)
42448000	Clothing and Clothing Accessories Stores	42458000	Clothing, Clothing Accessories, Shoe, and Jewelry Retailers (1)
42448100	Clothing Stores	42458100	Clothing and Clothing Accessories Retailers (1)
42448200	Shoe Stores	42458200	Shoe Retailers (1)
42448300	Jewelry, Luggage, and Leather Goods Stores	42458300	Jewelry, Luggage, and Leather Goods Retailers (1)
42451000	Sporting Goods, Hobby, Musical Instrument, and Book Stores	42459000	Sporting Goods, Hobby, Musical Instrument, Book, and Miscellaneous Retailers (1)(2)
42451100	Sporting Goods, Hobby, and Musical Instrument Stores	42459100	Sporting Goods, Hobby, and Musical Instrument Retailers (1)
42451200	Book Stores and News Dealers	42459200	Book Retailers and News Dealers (1)

NAICS 2017		NAICS 2022	
Series Code	CES Series Title	Series Code	CES Series Title
42452000	General Merchandise Stores	42455000	General Merchandise Retailers (1)(2)
42452200	Department Stores	42455100	Department Stores (1)
42452300	General Merchandise Stores, including Warehouse Clubs and Supercenters	42455200	Warehouse Clubs, Supercenters, and Other General Merchandise Retailers (1)(2)
42453000	Miscellaneous Store Retailers	42455000	General Merchandise Retailers (1)(2)
42453000	Miscellaneous Store Retailers	42459000	Sporting Goods, Hobby, Musical Instrument, Book, and Miscellaneous Retailers (1)(2)
42453200	Office Supplies, Stationery, and Gift Stores	42459400	Office Supplies, Stationery, and Gift Retailers (1)
42453300	Used Merchandise Stores	42459500	Used Merchandise Retailers (1)
42453900	Other Miscellaneous Store Retailers	42455200	Warehouse Clubs, Supercenters, and Other General Merchandise Retailers (1)(2)
42453900	Other Miscellaneous Store Retailers	42459900	Other Miscellaneous Retailers (1)
42454000	Nonstore Retailers (3)		
42454100	Electronic Shopping and Mail-Order Houses (3)		
50511000	Publishing Industries (except Internet)	50513000	Publishing Industries (2)(4)
50511100	Newspaper, Periodical, Book, and Directory Publishers	50513100	Newspaper, Periodical, Book, and Directory Publishers (4)
50511200	Software Publishers	50513200	Software Publishers
50515000	Broadcasting (except Internet)	50516000	Broadcasting and Content Providers (2)(4)
50515100	Radio and Television Broadcasting	50516100	Radio and Television Broadcasting Stations
50515100	Radio and Television Broadcasting	50516200	Media Streaming Distribution Services, Social Networks, and Other Media Networks and Content Providers (2)(4)
50515200	Cable and Other Subscription Programming	50516200	Media Streaming Distribution Services, Social Networks, and Other Media Networks and Content Providers (2)(4)
50517300	Wired and Wireless Telecommunications Carriers	50517100	Wired and Wireless Telecommunications (except Satellite) (2)
50517311	Wired Telecommunications Carriers	50517111	Wired Telecommunications Carriers

NAICS 2017		NAICS 2022	
Series Code	CES Series Title	Series Code	CES Series Title
50517900	Other Telecommunications	50517100	Wired and Wireless Telecommunications (except Satellite) (2)
50517900	Other Telecommunications	50517800	All Other Telecommunications
50518000	Data Processing, Hosting, and Related Services	50518000	Computing Infrastructure Providers, Data Processing, Web Hosting, and Related Services
50519000	Other Information Services	50513000	Publishing Industries (2)(4)
50519000	Other Information Services	50516000	Broadcasting and Content Providers (2)(4)
50519000	Other Information Services	50519000	Web Search Portals, Libraries, Archives, and Other Information Services (4)
55523110	Investment Banking and Securities Dealing	55523150	Investment Banking and Securities Intermediation (2)
55523120	Securities Brokerage	55523150	Investment Banking and Securities Intermediation (2)
65623200	Residential Intellectual and Developmental Disability, Mental Health and Substance Abuse Facilities	65623200	Residential Intellectual and Developmental Disability, Mental Health, and Substance Abuse Facilities (title change only)
65624400	Child Day Care Services	65624400	Child Care Services (title change only)

(1) Includes partial split of NAICS 2017 454110 and 454390

(2) New aggregation of existing series and reconstructed components

(3) Discontinued series with no direct successor

(4) Includes partial split of NAICS 2017 519130

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.⁸

⁸ 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>.

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.⁹ 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 2023. The updated birth-death factors are also used as inputs to produce the revised estimates of payroll employment for October 2022 to December 2022.

Seasonal adjustment

CES state and area payroll employment data are seasonally adjusted by a two-step process.¹⁰ 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 2022).¹¹ By accounting for the differing seasonal patterns found in historical benchmark employment data and the sample-based employment estimates, this technique yields improved seasonally adjusted series with respect to analysis of month-to-month employment change.¹²

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)

⁹ Further information on X-13ARIMA-SEATS is available on the Census Bureau website at <https://www.census.gov/data/software/x13as.html>.

¹⁰ 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>.

¹¹ 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," *Proceedings of the Section on Survey Research Methods*, American Statistical Association, available at <https://www.bls.gov/osmr/research-papers/1994/pdf/st940350.pdf>.

¹² 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>.

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.¹³

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.¹⁴ 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.¹⁵

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.

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.¹⁶

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 2022. For September 2022, the range of the revision for total nonfarm payroll employment across all states is from -2.0 percent to 3.1 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.

¹³ A list of BLS-published areas is available at <https://download.bls.gov/pub/time.series/sm/sm.area>.

¹⁴ 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>.

¹⁵ For more information on the presence and treatment of calendar effects in CES data, see <https://www.bls.gov/osmr/research-papers/1996/pdf/st960190.pdf>.

¹⁶ For a list of outliers identified during the concurrent seasonal adjustment process, see <https://www.bls.gov/sae/seasonal-adjustment/#outliers>.

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 2022. 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.

Table 1. Average absolute percentage differences between state employment estimates and benchmarks by industry, not seasonally adjusted, September 2018–September 2022 (all values in percent)

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

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 3.8 percent and 2.2 percent, respectively, for September 2022. However, for the same month, the average absolute level revision across all states for the information industry is 1,700, while the average absolute level revision across all states for the professional and business services industry is 9,400. (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 2022 (all values payroll employment)

Industry ¹	Sep. 2018 ²	Sep. 2019	Sep. 2020	Sep. 2021	Sep. 2022
Total nonfarm.....	13,400	13,400	27,400	24,700	16,600
Mining and logging.....	600	700	1,100	700	600
Construction.....	3,400	3,100	3,500	3,600	3,400
Manufacturing.....	2,700	2,900	4,400	3,100	3,600
Trade, transportation, and utilities....	6,600	4,700	7,700	5,400	6,400
Information.....	1,100	1,300	1,600	2,200	1,700
Financial activities.....	2,100	1,900	3,100	3,200	3,500
Professional and business services...	5,000	5,900	7,700	6,400	9,400
Education and health services.....	2,700	4,700	5,600	6,600	4,400
Leisure and hospitality.....	4,600	4,500	13,300	9,900	5,700
Other services.....	3,100	1,800	5,100	3,100	2,700
Government.....	5,200	3,400	4,600	3,900	3,400
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
Mean.....	-11,300	-8,100	-15,400	20,300	11,800
Standard deviation.....	20,000	21,500	39,300	44,600	21,600

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.

Revisions by state

For September 2022, nonfarm payroll employment was revised upward in 37 states and downward in 13 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 2022 (all values in percent)

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

(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.

The distribution of percent revisions for September 2022, March 2022, and December 2022 can be found in exhibit 2. Quintiles are representative of 20 percent of the range of state benchmark revisions. For example, 20 percent of the revisions are -0.2 or less for September 2022 while 100 percent of the revisions are equal to or less than 3.1 percent.

Exhibit 2. Distribution of state percent revisions, March 2022, September 2022, and December 2022 (all values in percent)

Percentiles of Percent Revisions	March 2022	September 2022	December 2022
20th percentile.....	-0.1	-0.2	-0.3
40th percentile.....	0.3	0.2	0.1
60th percentile.....	0.7	0.4	0.5
80th percentile.....	1.1	0.9	0.9
100th percentile.....	3.0	3.1	3.2

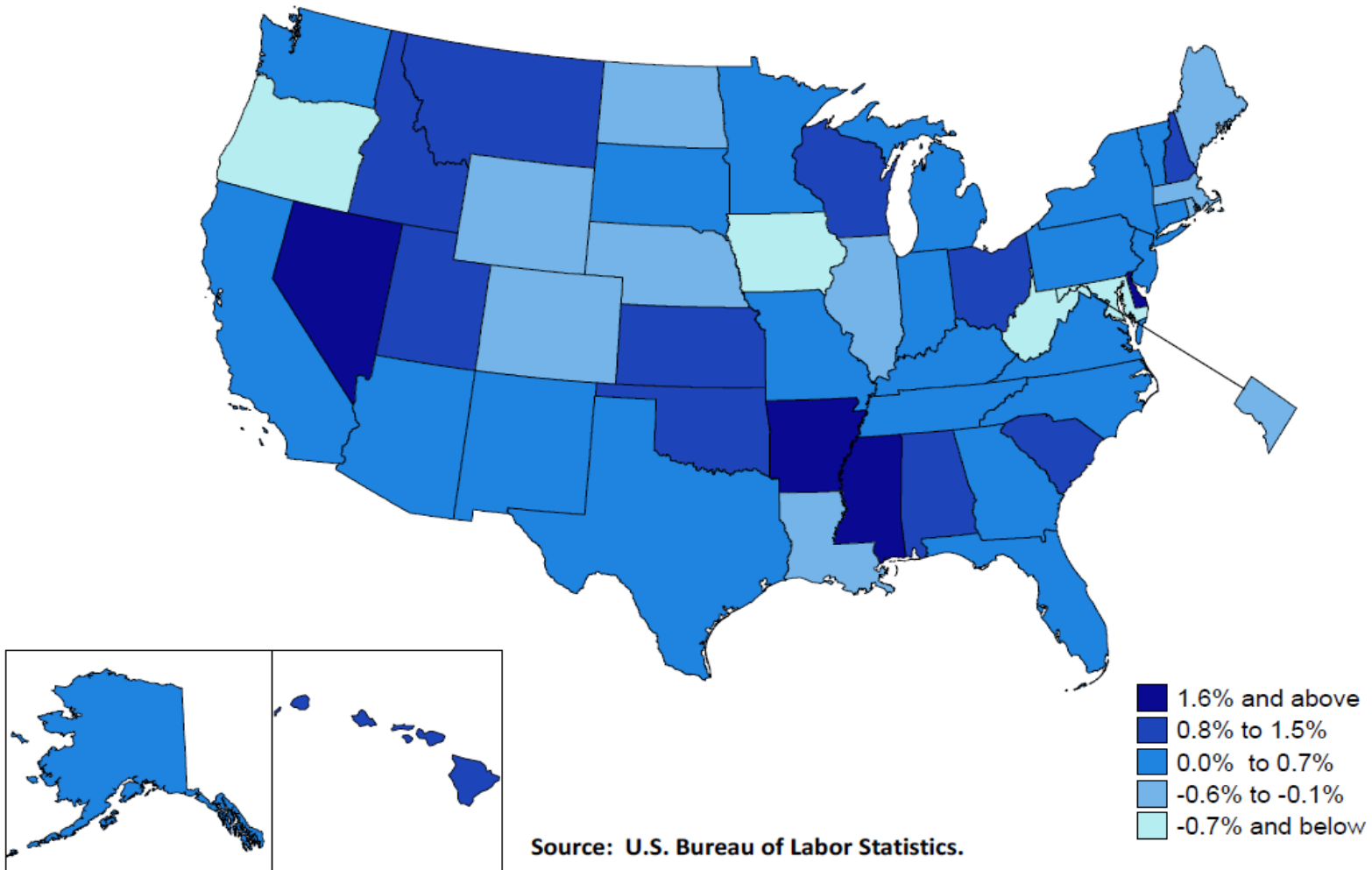
Revisions by metropolitan statistical area

For all MSAs published by the CES program, the total nonfarm percentage revision for September 2022 ranged from -6.0 percent to 7.7 percent, with an average absolute percentage revision of 1.5 percent across all published MSAs. (See table 4.) For comparison, at the statewide level, the range was from -2.0 percent to 3.1 percent, with an average absolute revision of 0.7 percent for September 2022. (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 2022 had an average absolute revision of 1.1 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 1.8 percent. (See table 4.)

Table 1. Benchmark revisions for nonfarm employment in metropolitan areas for September 2022, not seasonally adjusted

Measure	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	189	148	16	36
Average absolute percentage revision.....	1.5	1.8	1.5	0.8	1.1
Range.....	-6.0 to 7.7	-6.0 to 7.7	-4.4 to 6.3	-1.0 to 2.7	-3.1 to 3.4
Mean.....	0.8	0.8	0.8	0.5	0.5
Standard deviation.....	1.8	2.1	1.7	1.0	1.4

Map 1. Percent differences between nonfarm payroll employment benchmarks and estimates by State, September 2022



Appendix

Table A1. Average absolute percentage differences between state employment estimates and benchmarks by industry, not seasonally adjusted, March 2017–March 2022 and December 2022 (all values in percent)

Industry ¹	Mar. 2017	Mar. 2018 ²	Mar. 2019	Mar. 2020	Mar. 2021	Mar. 2022	Dec. 2022
Total nonfarm.....	0.4	0.4	0.4	0.5	0.8	0.7	0.7
Mining and logging.....	3.7	3.6	3.4	4.1	4.1	4.1	4.1
Construction.....	2.5	2.1	3.5	2.2	2.6	2.6	3.3
Manufacturing.....	1.3	1.2	1.3	1.3	1.3	1.5	1.6
Trade, transportation, and utilities.....	0.7	1.0	0.8	0.9	1.1	1.1	1.6
Information.....	2.7	2.2	2.3	3.0	3.8	3.5	3.9
Financial activities.....	1.6	1.5	1.5	1.4	1.6	1.9	2.7
Professional and business services.....	1.5	1.3	1.6	1.3	1.9	2.2	2.3
Education and health services.....	0.8	0.8	1.0	1.1	1.5	1.1	1.3
Leisure and hospitality.....	1.6	1.3	1.3	1.8	2.0	1.6	2.1
Other services.....	2.7	4.4	1.8	2.2	2.9	2.2	2.7
Government.....	0.8	0.8	0.6	0.7	0.7	0.7	0.9
Total nonfarm:							
Range.....	-1.0 to 1.2	-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	-1.9 to 3.2
Mean.....	-0.1	-0.1	0.1	0.3	0.7	0.6	0.4
Standard deviation.....	0.5	0.8	0.6	0.6	0.7	0.7	0.9

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.

Table A2. Average absolute level differences between state employment estimates and benchmarks by industry, not seasonally adjusted, March 2017–March 2022 and December 2022 (all values payroll employment)

Industry ¹	Mar. 2017	Mar. 2018 ²	Mar. 2019	Mar. 2020	Mar. 2021	Mar. 2022	Dec. 2022
Total nonfarm.....	7,100	9,200	8,200	12,900	23,900	17,700	16,000
Mining and logging.....	500	300	300	400	500	400	700
Construction.....	2,200	2,300	2,900	2,500	2,600	2,800	3,500
Manufacturing.....	2,200	1,900	2,100	2,200	2,200	2,700	3,500
Trade, transportation, and utilities.....	2,600	4,900	3,100	3,500	5,400	4,900	6,200
Information.....	1,000	1,200	1,200	1,200	1,500	1,600	1,500
Financial activities.....	1,600	1,500	2,000	2,100	2,600	2,800	3,600
Professional and business services.....	3,300	4,000	4,100	4,600	6,000	8,700	10,300
Education and health services.....	3,200	3,100	3,800	4,300	6,000	4,100	4,900
Leisure and hospitality.....	3,400	3,000	2,600	5,100	4,600	4,100	6,300
Other services.....	2,200	2,400	1,500	2,700	2,500	1,800	2,700
Government.....	3,000	3,400	2,100	2,800	2,900	2,500	4,500
Total nonfarm:							
Range.....	-44,900 to 16,400	-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	-29,000 to 88,700
Mean.....	-2,300	1,200	1,900	8,100	20,400	16,400	11,900
Standard deviation.....	11,000	16,200	11,400	18,700	38,900	25,400	21,300

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.

Table A3. Percent differences between nonfarm payroll employment benchmarks and estimates by state, not seasonally adjusted, March 2017–March 2022 and December 2022 (all values in percent)

State	Mar. 2017	Mar. 2018	Mar. 2019	Mar. 2020	Mar. 2021	Mar. 2022	Dec. 2022
Alabama.....	0.8	0.2	-0.2	-0.2	0.2	1.2	1.2
Alaska.....	0.2	-0.4	-0.6	0.6	1.1	0.5	(1)
Arizona.....	0.5	0.4	0.4	0.2	0.8	1.6	0.6
Arkansas.....	-0.2	1.4	0.5	1.4	0.9	1.3	2.0
California.....	(1)	0.3	(1)	0.5	1.2	0.8	0.5
Colorado.....	0.4	-0.2	0.1	0.2	0.8	0.1	-1.0
Connecticut.....	-0.2	-0.2	-0.5	0.3	0.9	1.0	0.1
Delaware.....	0.1	0.3	0.5	-0.1	0.8	3.0	3.1
District of Columbia.....	0.3	-0.1	0.3	-0.1	-0.6	-0.1	-0.3
Florida.....	-0.1	(1)	-0.1	0.3	2.0	0.4	0.4
Georgia.....	-0.8	0.3	0.1	0.5	0.5	(1)	0.3
Hawaii.....	0.4	-0.7	-0.1	0.1	2.0	1.5	1.2
Idaho.....	0.4	-0.1	0.4	1.0	0.3	1.3	0.9
Illinois.....	0.3	0.4	-0.6	0.6	0.6	0.1	-0.3
Indiana.....	-0.3	0.6	0.1	-0.3	0.9	-0.1	0.6
Iowa.....	-0.5	-0.2	-0.1	0.8	0.6	0.5	-0.2
Kansas.....	-0.4	-0.4	(1)	-0.1	-0.5	0.7	1.5
Kentucky.....	-0.9	0.2	-0.4	0.9	1.6	0.9	0.3
Louisiana.....	0.1	0.2	0.5	0.5	1.4	(1)	-0.3
Maine.....	0.2	0.4	0.7	1.1	1.7	0.2	0.1
Maryland.....	-1.0	0.4	0.3	-0.8	-0.5	-0.4	-0.4
Massachusetts.....	-0.2	0.2	0.7	0.9	1.1	0.3	-0.3
Michigan.....	-0.2	-0.1	-0.1	-0.2	0.5	0.3	0.3
Minnesota.....	(1)	(1)	0.5	0.8	0.8	0.4	(1)
Mississippi.....	0.5	-1.1	-0.4	(1)	0.5	0.3	1.5
Missouri.....	-0.3	-0.4	-0.3	1.1	0.2	-0.1	0.7
Montana.....	-0.8	0.1	0.2	(1)	1.4	0.6	1.2
Nebraska.....	-0.2	-0.3	-0.1	-0.2	-0.6	-0.5	-0.4
Nevada.....	0.8	0.4	-0.5	2.1	1.0	2.0	3.2
New Hampshire.....	-0.3	-0.2	0.2	0.5	0.2	0.7	0.4
New Jersey.....	(1)	-0.9	(1)	0.8	1.5	1.4	0.7
New Mexico.....	-0.8	0.1	0.3	-0.4	1.0	-0.5	-0.2
New York.....	0.1	0.7	0.3	0.1	0.8	0.8	0.8
North Carolina.....	(1)	(1)	0.5	0.8	1.3	0.7	0.1
North Dakota.....	-1.0	1.2	1.2	(1)	-0.3	-0.1	0.3
Ohio.....	(1)	-0.5	-0.1	0.3	0.7	0.8	0.8
Oklahoma.....	-0.1	0.1	0.7	0.5	0.8	0.5	1.0
Oregon.....	0.2	(1)	-0.1	0.7	0.9	(1)	-1.0
Pennsylvania.....	(1)	(1)	0.3	0.2	0.7	0.9	0.4
Rhode Island.....	-0.7	-0.6	1.7	1.0	1.8	0.6	-0.3
South Carolina.....	0.5	0.8 ²	0.2	-0.7	0.5	1.2	0.8
South Dakota.....	-0.6	-0.3	-1.6	-0.1	0.2	1.2	(1)
Tennessee.....	-0.5	-0.1	0.4	-0.3	0.6	0.4	0.4
Texas.....	-0.4	-0.3	0.2	-0.2	-0.3	0.2	0.1
Utah.....	-0.1	-0.1	-0.3	-1.0	0.5	0.6	0.9
Vermont.....	-0.7	-0.1	0.6	0.6	-0.4	1.4	1.0
Virginia.....	-0.2	0.2	0.4	(1)	0.6	0.3	0.4
Washington.....	-0.2	-0.2	-0.7	-0.1	-0.7	0.8	0.6
West Virginia.....	0.2	-4.4	-2.1	0.3	(1)	-0.4	-1.9
Wisconsin.....	(1)	0.2	0.1	0.3	0.7	1.1	0.7
Wyoming.....	1.2	-0.1	0.1	0.3	0.7	-0.6	0.4

(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.

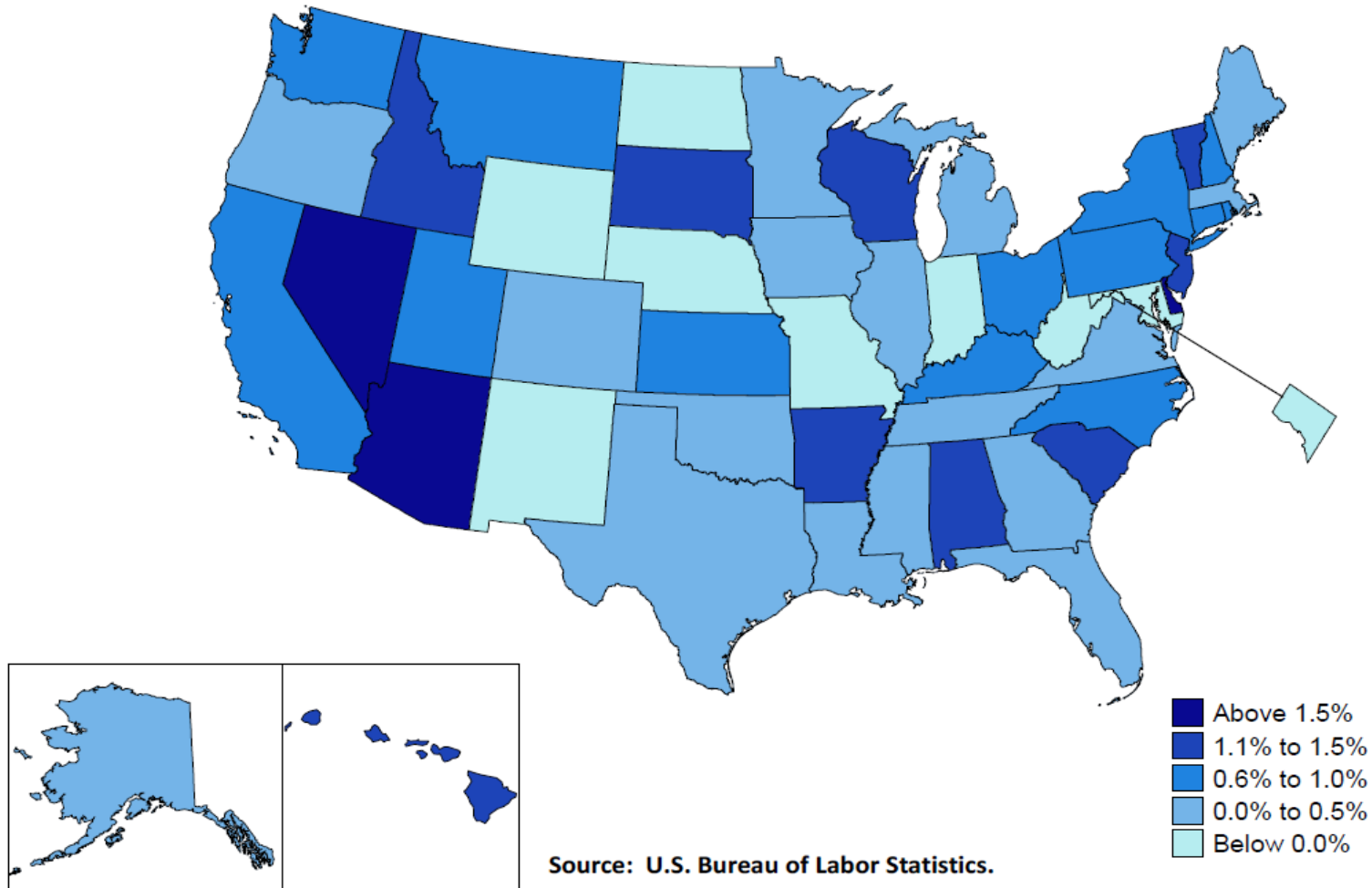
Table A4. Benchmark revisions for nonfarm employment in metropolitan areas for March 2022, not seasonally adjusted

Measure	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	189	148	16	36
Average absolute percentage revision.....	1.2	1.3	1.2	0.9	1.0
Range.....	-6.0 to 6.7	-6.0 to 6.7	-4.1 to 4.1	-0.2 to 2.1	-2.3 to 2.5
Mean.....	0.5	0.4	0.6	0.8	0.7
Standard deviation.....	1.5	1.7	1.4	0.7	1.0

Table A5. Benchmark revisions for nonfarm employment in metropolitan areas for December 2022, not seasonally adjusted

Measure	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	189	148	16	36
Average absolute percentage revision.....	1.6	1.8	1.5	0.9	1.2
Range.....	-6.6 to 7.2	-6.6 to 7.2	-4.1 to 6.4	-1.0 to 3.2	-3.3 to 3.1
Mean.....	0.8	0.9	0.9	0.4	0.5
Standard deviation.....	1.9	2.1	1.7	1.2	1.5

Map A1. Percent differences between nonfarm payroll employment benchmarks and estimates by State, March 2022



Map A2. Percent differences between nonfarm payroll employment benchmarks and estimates by State, December 2022

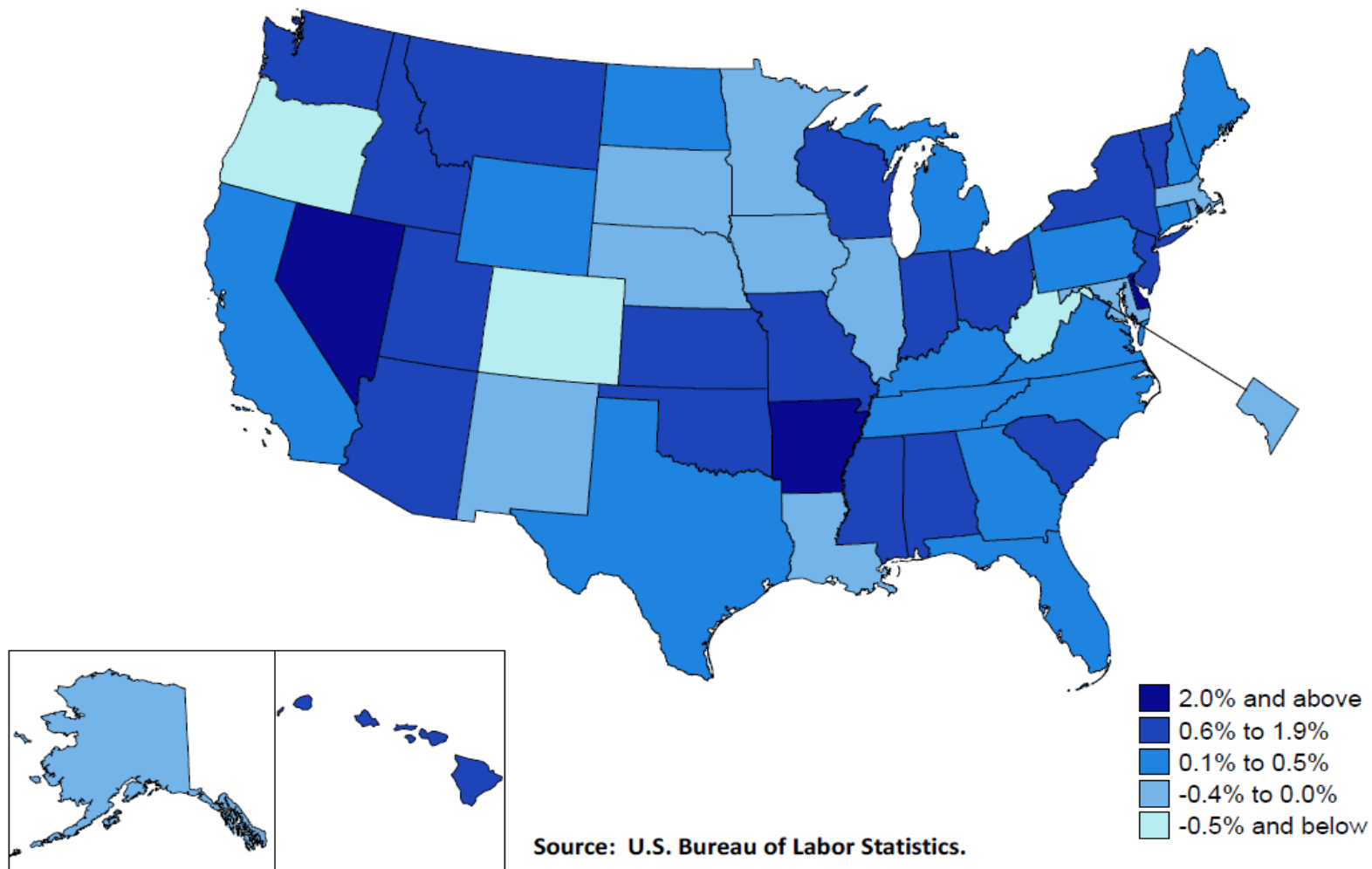


Table of figures

Tables

Table 1. Average absolute percentage differences between state employment estimates and benchmarks by industry, not seasonally adjusted, September 2018–September 2022 (all values in percent).....	9
Table 2. Average absolute level differences between state employment estimates and benchmarks by industry, not seasonally adjusted, September 2018–September 2022 (all values payroll employment)	10
Table 3. Percent differences between nonfarm payroll employment benchmarks and estimates by state, not seasonally adjusted, September 2018–September 2022 (all values in percent).....	11
Table 4. Benchmark revisions for nonfarm employment in metropolitan areas for September 2022, not seasonally adjusted.....	12
Table A1. Average absolute percentage differences between state employment estimates and benchmarks by industry, not seasonally adjusted, March 2017–March 2022 and December 2022 (all values in percent)	14
Table A2. Average absolute level differences between state employment estimates and benchmarks by industry, not seasonally adjusted, March 2017–March 2022 and December 2022 (all values payroll employment)	15
Table A3. Percent differences between nonfarm payroll employment benchmarks and estimates by state, not seasonally adjusted, March 2017–March 2022 and December 2022 (all values in percent)	16
Table A4. Benchmark revisions for nonfarm employment in metropolitan areas for March 2022, not seasonally adjusted.....	17
Table A5. Benchmark revisions for nonfarm employment in metropolitan areas for December 2022, not seasonally adjusted.....	17

Exhibits

Exhibit 1. CES Series Reclassifications from NAICS 2017 to NAICS 2022	4
Exhibit 2. Distribution of state percent revisions, March 2022, September 2022 and December 2022 (all values in percent)	12

Maps

Map 1. Percent differences between nonfarm payroll employment benchmarks and estimates by state, September 2022.....	13
Map A1. Percent differences between nonfarm payroll employment benchmarks and estimates by state, March 2022.....	18
Map A2. Percent differences between nonfarm payroll employment benchmarks and estimates by state, December 2022.....	19

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 EST 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>.