A Guide to State-Level Estimates of Labor Force Participation Rates

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Between February 2020 and April 2020, the US labor force participation rate (LFPR) fell by more than 3 percentage points—that's five times larger than the largest two-month drop from 1970 through 2019. Nearly three years later, in January 2023, the US LFPR remained almost a percentage point below its prepandemic level. Such large changes in the US LFPR have brought new attention to state-level estimates of the LFPR, as people want to know how their state has fared. This District Data Brief is a short introduction to state-level estimates of the LFPR and what they can—and cannot—tell us about recent trends in the LFPRs of states in the Fourth Federal Reserve District.[1] While monthly state-level LFPRs are best thought of as "ballpark estimates," the annual estimates from the American Community Survey are precise enough to measure year-to-year changes in state-level LFPRs.

Things to know about monthly state-level LFPR estimates

The US Bureau of Labor Statistics (BLS) estimates monthly state-level LFPRs as part of the Local Area Unemployment Statistics (LAUS) program. While the US LFPR is estimated directly from the Current Population Survey (CPS), state-level LFPRs are estimated with models that incorporate data sources in addition to the CPS, and the estimates are smoothed. The modeling process is designed to reduce sampling error from the small state-level samples in the CPS, but the models also introduce the risk of modeling error.[2]

Each March, LAUS revises the state-level LFPRs, with LFPRs from the prior five calendar years subject to revisions. For each state in the Fourth District, Figure 1 shows two sets of LFPR estimates: the first published estimate and the latest revised estimate. The first estimates are more volatile than the revised estimates. One reason for this is that the first estimates and the revised estimates are smoothed

[1] The Fourth Federal Reserve District encompasses all of Ohio, western Pennsylvania, eastern Kentucky, and the northern panhandle of West Virginia.
[2] Sampling error is the difference between the true population value and the estimate from the sample, while modeling error is the corresponding difference due to the model used.

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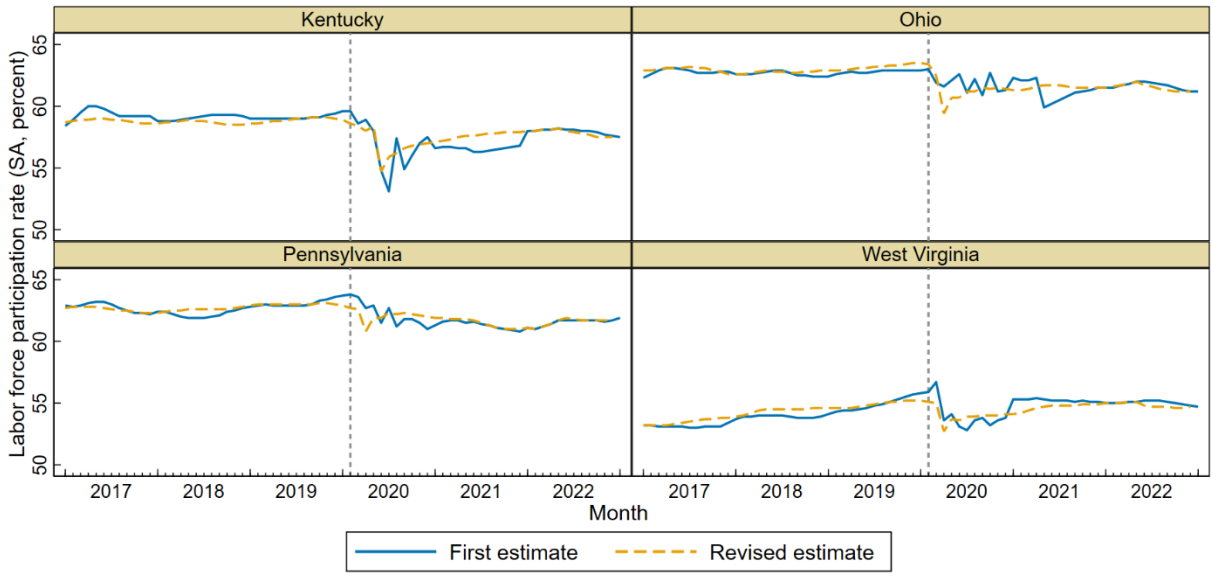
differently.[3] The first estimates are smoothed with data from the month being measured and the prior 6 months; the revised estimates are smoothed with the data used for the first-published estimates and the data from the following 6 months (to the extent available).

Figure 1. Comparison of First-Published and the Latest Revised LFPR Estimates in Kentucky, Ohio, Pennsylvania, and West Virginia



Note: The dashed vertical lines indicate the beginning of the COVID-19 pandemic in the United States, February 2020.
Source: BLS (via Haver Analytics and ALFRED).

Drawing conclusions from monthly state-level LFPR estimates

Often analysts look at only the latest version of the data, which are the first estimates for the current calendar year and the latest revised estimates for past years. This can be misleading because the first estimates are generally more volatile than the revised estimates. The precision of the first estimates is measured by the 90 percent confidence intervals that LAUS publishes.[4]

Confidence intervals around state-level LFPRs are wide, especially when compared to year-to-year changes in the LFPR. Table 1 has estimates of LFPRs, 12-month changes in LFPRs, and their 90 percent confidence intervals. In January 2023, the confidence intervals are sufficiently wide that, for example, we cannot be certain that Pennsylvania's LFPR rose between January 2022 and January 2023. This is true

3 In statistics, smoothing means applying an algorithm designed to reduce noise and amplify underlying patterns in the data.
4 A confidence interval refers to the range that the actual value is likely to fall within. For this example, imagine that we could get the true LFPR of a state by surveying every noninstitutionalized civilian over the age of 15 in the state. There is a 90 percent chance that this "true" LFPR would fall within the 90 percent confidence interval.

even though Pennsylvania's estimated increase is four times larger than that of the nation (0.8 percentage points and 0.2 percentage points, respectively).

Table 1. January 2023 LFPR Estimates, 12-Month Changes, and Confidence Intervals for the Nation, Kentucky, Ohio, Pennsylvania, and West Virginia

	January 2023 LFPR		12-month change in LFPR	
Geographic unit	Estimate	90% Confidence interval	Estimate	90% Confidence interval
Nation	62.4	62.1–62.7	0.2	0.0–0.4
Kentucky	57.5	55.8–59.1	-0.5	–1.6–0.6
Ohio	61.2	60.0–62.4	-0.3	–1.3–0.7
Pennsylvania	61.9	60.8–62.9	0.8	–0.1–1.7
West Virginia	54.7	53.0–56.3	-0.3	–1.1–0.5

Notes: The national estimates are from the Current Population Survey and the state-level estimates are from LAUS. The confidence intervals of the 12-month changes were calculated by the authors from data published by the BLS, as was the confidence interval of the nation's January 2023 LFPR.
Sources: BLS (via Haver Analytics), BLS, and authors' calculations.

The wide confidence intervals around state-level LFPRs invite the question: What *can* we conclude from the monthly estimates? One thing we can conclude is that in January 2023, West Virginia and Kentucky had lower LFPRs than Ohio, Pennsylvania, and the nation. Since the overlap in their confidence intervals is small, we can say it is likely that Kentucky had a higher LFPR than West Virginia. Since the lower bound of the confidence interval of the estimated change in Pennsylvania's LFPR is –0.1 percentage point, we can say that it is likely that Pennsylvania's LFPR rose between January 2022 and January 2023. Given that the estimated 12-month drop in Ohio's LFPR is only 0.3 percentage points and it has a wide confidence interval, we would want to be more cautious and say that it is slightly more likely that Ohio's LFPR fell than it is that it rose. This is also the most appropriate way to describe the 12-month changes in Kentucky and West Virginia.

More precise, less timely state-level LFPR estimates

State-level LFPR estimates are also available from the US Census Bureau's American Community Survey (ACS). The ACS estimates are substantially more precise than the monthly LAUS estimates, but they are available only as 1-year or 5-year estimates, and they are not as timely as the LAUS estimates. For example, the 2021 ACS estimates were released in September 2022, six months after the release of the 2021 LAUS estimates. The annual ACS and LAUS LFPR estimates can differ for a variety of reasons:[5]

[5] For more complete and detailed descriptions of the relevant differences between the ACS and the CPS, please see *https://www.bls.gov/lau/acsqa.htm* and Kromer and Howard (2011).

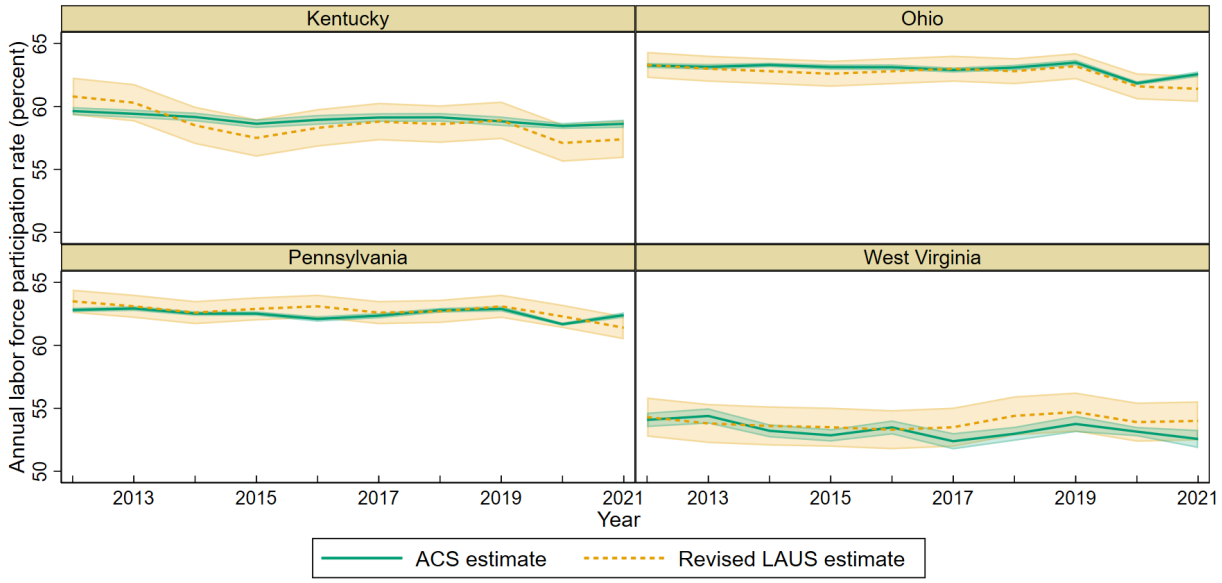
1. Differences in population covered: The ACS covers civilians living in institutionalized group quarters, such as correctional institutions and nursing facilities, while these individuals are excluded from the CPS, the survey that is the foundation of the LAUS estimates. Which coverage is preferrable depends on what you want to measure.
2. Differences in collection methods and survey questions: Most ACS responses are collected by mail via paper survey forms. In contrast, all responses to the CPS are collected over the phone or in-person, allowing both the respondent and the interviewer to ask clarifying questions. The CPS also has more extensive questions about labor force status than the ACS, which enables the CPS to more precisely determine whether someone is in the labor force. All else equal, these differences suggest that the CPS/LAUS provides better estimates of the LFPR.
3. Sampling and modeling error: Like any survey of a randomized sample, both the ACS and the LAUS estimates can have sampling error. The ACS has a much larger sample than the CPS, so the ACS estimates have smaller expected sampling error. In addition, the LAUS estimates have modeling error because they incorporate both survey data and models. Therefore, the ACS generates more precise state-level estimates.
4. Whether estimates are smoothed: ACS 1-year estimates are not smoothed and reflect only one year's data. The LAUS estimates are smoothed. This means that the LAUS estimates can be affected by estimates from surrounding years. All else equal, this gives the ACS an advantage in measuring the LFPR in a given year.

Figure 2 shows the annual LFPR estimates for Fourth District states from the ACS and LAUS between 2012 and 2021. The figure also includes confidence intervals for each set of estimates.[6] The most obvious difference between the series is that the LAUS confidence intervals are much wider than the ACS confidence intervals. In 2021, the LAUS confidence interval is more than four times as wide as the ACS confidence interval in Kentucky, Ohio, and Pennsylvania and more than twice as wide as the ACS confidence interval in West Virginia. The difference in the size of the confidence intervals is smaller in West Virginia because the difference in size of the ACS sample and the CPS sample is less dramatic in West Virginia than in the other states. In 2021, there were three ACS respondents for each unique CPS respondent in West Virginia—the comparable figures for the other three states range from 12 to 19.[7]

[6] We calculated the ACS LFPRs and their approximate confidence intervals with data from table number B23025 each year. The confidence intervals were calculated with the methodology in Chapter 8 of US Census Bureau (2020). LAUS does not publish the information necessary to calculate confidence intervals for the annual state-level LFPR estimates. We have assumed that the margin of error of a state's LFPR is equivalent to the margin of error of that state's employment-to-population ratio in 2021. LAUS publishes model-based error estimates for both the LFPR and the employment-to-population ratio for monthly data, and the error estimates for the LFPR are larger by 1 percent to 5 percent. Therefore, the confidence intervals for the LAUS LFPR estimates in Figure 2 are a good approximation, but they may be a little too narrow.

[7] Based on authors' calculations from IPUMS CPS microdata (Flood et al. 2022) and published ACS tables for these four states.

Figure 2. Annual LFPR Estimates from ACS and LAUS with Confidence Intervals for Kentucky, Ohio, Pennsylvania, and West Virginia



Notes: Shaded area shows approximate 90 percent confidence intervals. See footnote 5 for details.
Sources: BLS and US Census Bureau.

Because of the ACS estimates' greater precision and absence of smoothing, we recommend the ACS LFPR estimates over the LAUS LFPR estimates, even after the LAUS data have been revised (as they have been in Figure 2). The ACS and LAUS LFPR estimates are similar to each other in most of the District states and years. Of the 40 state-by-year data points in Figure 2, there are only three times when the ACS estimate is outside the LAUS confidence interval. For the period from 2012 to 2021, the average percentage point difference between the ACS and the LAUS LFPRs was 0.2 in Kentucky, 0.4 in Ohio, –0.2 in Pennsylvania, and –0.7 in West Virginia. This tells us that, notwithstanding the differences between these data sources discussed above, the ACS LFPR estimates are reasonable substitutes for the LAUS LFPR estimates, especially for Kentucky, Ohio, and Pennsylvania. There is a larger gap between the ACS and LAUS in West Virginia, but we would still choose to use the ACS estimates where feasible because of their smaller confidence intervals.

While the ACS and LAUS estimates are similar in most years, that was not the case in 2021: the ACS estimates for Kentucky, Ohio, and Pennsylvania for 2021 are at least 1 percentage point higher than the corresponding LAUS estimates. Except in West Virginia, the 2021 LFPR was much closer to the 2019 rate in the ACS data than in the LAUS data. In Kentucky, Ohio, and Pennsylvania, the drop in the ACS LFPR between 2019 and 2021 is at least 0.9 percentage points smaller than the corresponding drop in the LAUS LFPR (see Table 2). These state-level differences are similar to the corresponding national

difference: the drop in the US LFPR is 0.8 percentage points smaller in the ACS than in LAUS.[8] This means that the differences across sources are not a by-product of the modeling process used to generate state-level estimates. Both the ACS and the CPS had lower-than-typical response rates in 2021, a situation that may have led to unusual estimates from each survey. Currently, the most we can conclude is that the LFPRs may have recovered more strongly in 2021 than suggested by the LAUS estimates.

Table 2. 2019 and 2021 LFPRs from the American Community Survey and Local Area Unemployment Statistics for the Nation, Kentucky, Ohio, Pennsylvania, and West Virginia

	ACS LFPR			LAUS Annual LFPR		
Geographic unit	2019	2021	Change	2019	2021	Change
Nation	63.6	63.0	–0.6	63.1	61.7	–1.4
Kentucky	58.8	58.6	–0.2	58.9	57.4	–1.5
Ohio	63.5	62.6	–0.9	63.2	61.4	–1.8
Pennsylvania	62.9	62.4	–0.5	63.1	61.4	–1.7
West Virginia	53.8	52.6	–1.2	54.7	54.0	–0.7

Note: The national estimates in the LAUS columns are from the Current Population Survey.
Sources: BLS (via Haver Analytics) and US Census Bureau.

For readers who prefer precise numbers, Table 3 has the ACS LFPR estimates for the nation and Fourth District states for 2021, the latest data available.

Table 3. 2021 LFPR Estimates, 12-Month Changes, and Confidence Intervals from the American Community Survey for the Nation, Kentucky, Ohio, Pennsylvania, and West Virginia

	2021 LFPR		1-year change in LFPR	
Geographic unit	Estimate	90% Confidence interval	Estimate	90% Confidence interval
Nation	63.0	62.9–63.1	0.8	0.7–0.9
Kentucky	58.6	58.3–59.0	0.2	–0.2–0.6
Ohio	62.6	62.3–62.8	0.7	0.4–1.0
Pennsylvania	62.4	62.2–62.6	0.7	0.5–1.0
West Virginia	52.6	51.8–53.3	–0.6	–1.4–0.2

Note: Confidence intervals calculated by authors according to methodology in Chapter 8 of US Census Bureau (2020).
Sources: US Census Bureau, authors' calculations.

Conclusion

We hope that this District Data Brief helps readers understand the limitations of the monthly state-level estimates of the LFPR from LAUS. The BLS's LAUS program leverages available data to produce timely monthly state-level LFPRs, but it is best to view these as "ballpark estimates." This is especially true of data for months in the current calendar year because they have not had their annual revision. The margins

[8] To match Table 2, we are referring to the national CPS estimate as the national LAUS estimate.

of error for the initial LAUS estimates tend to be larger than month-to-month, or even year-to-year, changes in the LFPRs; this makes them poorly suited to looking at changes over time.

The ACS and LAUS estimates can be materially different. For example, the drop in Pennsylvania's LFPR between 2019 and 2021 is three times larger in the LAUS estimates than in the ACS estimates (1.7 percentage points vs. 0.5 percentage points). While the ACS state-level estimates of the LFPR are less frequent and less timely, their increased precision makes them the authors' preferred source for looking at year-to-year changes.

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