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Where Low-Income Jobs Are Being Lost to COVID-19

Technical Appendix

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This revision uses both national- and state-level Bureau of Labor Statistics data from the Current Employment Statistics program , along with American Community Survey microdata from IPUMS USA,[1] to better measure net job loss (job loss minus new hires) locally by industry. These data replace the estimates based on Current Employment Statistics and advance state unemployment claims data used in the May 8 release. Advance state unemployment claims data are no longer used .

In this update, we use national and state data from the Bureau of Labor Statistics Current Employment Statistics (CES) program at the most granular industry available to measure net change in employment from February 2020 to the most recent month of data, which for the June 5 update is May 2020. Net change is total jobs lost plus new hires over the period of study; the reference date is the pay period that includes the 12th of the month measured.

Many detailed industry observations for the national data and all state-level data lag one month behind—that is, for the June 5 release, the most recent observations available are for the month of April. To correct this, we first project the lagged national estimates to the current month (in this case, April to May). For each detailed industry with a one-month lag, we determine the lowest-level "parent" industry that has current data, defined as the sector in the North American Industry Classification System (NAICS) hierarchy that contains the industry. To project the lagged "child" data forward, we add the February–previous month percent change for the child to the difference between (a) the February–

[1] Steven Ruggles, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas and Matthew Sobek, IPUMS USA: Version 10.0 [dataset] (Minneapolis, MN: IPUMS, 2020), https://doi.org/10.18128/D010.V10.0.

current month change for the parent and (b) the February–previous month change for the parent. For example, for the June 5 release, if both the child and the parent industries had declined 10 percent from February to April, and the parent industry had declined 15 percent from February to May, we would estimate the child industry changed by -10 + (-15 - -10) = -15 percent from February to May. At the end of this process, we have a dataset with net job loss calculated for all detailed industries from February 2020 to the current month.

Next, we impute the state-level change in employment by all national-level detailed industries using state and metro area employment, hours, and earnings data from the CES program. We use a similar process as described above. For each national detailed industry job loss calculation from February 2020 to the current month, we assign the lowest-level parent, defined as the sector in the NAICS hierarchy that contains the industry, available in the state-level series. We then project the estimate for each state by taking the national detailed estimate of net February–current month job loss and subtracting the difference between the national and state February–previous month net job losses. For example, for the June 5 release, if the detailed national industry had declined 20 percent from February to May, but only 10 percent from February to April, and the state parent industry had declined 10 percent from February to April, we would estimate the state detailed industry changed by -20 - (-10 - -10) = -20 percent from February to May. At the end of this process, we have a dataset with net job loss by state calculated for all detailed industries from February 2020 to the current month.

We construct a crosswalk from CES industry classifications to Census American Community Survey industry classifications, using expert judgment. Full documentation, assumptions, and notes are available on our Github repository. For some industries, we apply a direct one-to-one translation, while for others, the industry classification represents a formula calculated based on the crosswalk.

We apply the net job loss by American Community Survey industry classification to the 2014–18 five-year American Community Survey national file downloaded from IPUMS USA on May 25, 2020. We merge the net job loss estimates with the full microdata file by the state and industry variables, and we assign non-matches a net job loss of 0 percent. For broad use, we generate a random number and create a "disemployment" flag if the person's employment status shows they are currently employed (EMPSTAT=1) and the random number is less than 1 plus the net job loss for that record. However, we do not use this figure in our calculations. Instead, we multiply the PERWT variable by the net job loss for each record for which the employment status is 1 (currently employed). We then filter the dataset to all records with annual wages and salary (INCWAGE) below $40,000. We group and summarize the total number of low-income jobs and jobs lost or gained by state, Public Use Microdata Area (PUMA), and two-digit NAICS code, the latter coming from the crosswalk generated in the previous step. We

compute net low-income job loss or gain by dividing low-income jobs lost by total low-income jobs for each state, PUMA, and two-digit NAICS combination. We write out both the data with the disemployment flag and relevant IPUMS USA identifiers for broad research use, and we use the summarized file to create our estimates.

Finally, we create a crosswalk from 2010 PUMA to 2010 census tract by assigning each census tract's population-weighted centroid to the PUMA it falls within. For the 25 census tracts that do not have population-weighted centroids available from the Census, we use areal centroids. In addition, we identified one tract in Texas where the population-weighted centroid falls outside the United States. In this case, we also use the areal centroid. One tract in Alaska has both its population-weighted and areal centroids in a location we identified as the middle of the Pacific Ocean, so we manually hardcoded the centroid location for that census tract to the approximate middle of the tract on land. We then apply the low-income job loss estimates by state, PUMA, and two-digit NAICS code in the same way we applied estimates of total job loss by state and two-digit NAICS code in our previous updates.

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The text from here to page 4 is the appendix for the May 8, 2020, release of "Where Low-Income Jobs Are Being Lost to COVID-19."

This revision uses Bureau of Labor Statistics data from the Current Employment Statistics program, which calculates net job loss (job loss minus new hires) to measure job loss by industry. These data replace the estimates based on unemployment claims by industry from Washington State and New York State used in the April 24 and April 16 releases. The revision adjusts for state-level effects using advance unemployment claims using a slightly different method than previous releases to increase the accuracy of the state estimates.

In this update, data on job loss by industry are sourced solely from the Bureau of Labor Statistics (BLS) Current Employment Statistics program, which measures net change in employment from February 2020 to the most recent month of data, which for the May 8 update is April 2020. Net change is defined as total jobs lost plus new hires over the period of study, and the reference date is the pay period that includes the 12th of the month measured.

The data on job loss by industry no longer represent job loss as defined by total cumulative unemployment claims over the past *n* weeks. We no longer use state-by-industry unemployment claims data from Washington or New York. As a result, our job loss estimates from the previous releases are not directly comparable with this release.

We continue to use BLS state advanced unemployment claims data to adjust for state-level differences, but in this release we use a slightly different method. First we calculate the job loss by state and nationally from advanced unemployment claims data using the same method as our April 24 release. We pull the last *n* weeks of data for this analysis, where *n = 7* for the May 8 release. Similar to the last release, this time span counts unemployment claims beginning the week of Monday, March 16.

Assuming that net job loss trends across states are similar to unemployment claims across states, we first calculate the ratio of each state's job loss from unemployment claims data to the national estimate of job loss from unemployment claims data. Then, we multiply the ratio by the national-level job loss estimates for each industry to produce state-by-industry level estimates of net job loss. Where we observe job gains in a given industry in the Current Employment Statistics data, we derive state-by-industry job change estimates by multiplying the national industry-level job loss estimate by the inverse of the ratio defined in the first sentence of this paragraph. As a result, states experiencing above-average job losses see their estimated industry-level numbers inflated for industries with job losses and deflated for industries with job gains. We then apply these estimates to the LODES data using the same methods as the previous release to produce more granular net job loss estimates.

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The text from here to page 6 is the appendix for the April 24, 2020, release of "Where Low-Income Jobs Are Being Lost to COVID-19."

This revision incorporates updated data, adds data from New York State, and adjusts for state-level unemployment claims to increase the accuracy of the estimates. It does not incorporate data from Texas, which lags one week behind the Washington State and New York State data.

The data on job loss by industry are a weighted average of unemployment claims from Washington State and New York State to provide more accurate national employment estimates before the BLS April Current Employment Statistics are released May 8.

New York State reports construction and utilities claims as one figure, so we assume the share of job loss in these sectors is similar to the losses in Washington State. We create separate numbers for construction and utilities by multiplying New York's figure by the share of jobs in Washington State in the construction, and then utilities, industries. For example, if utilities make up 5 lost jobs and construction 95 lost jobs in Washington State, we would say utilities make up 5 percent and construction 95 percent of all construction and utilities jobs. If New York reports 1,000 construction and utilities jobs lost, we assign utilities jobs lost as 50 and construction jobs lost as 950.

The denominator for total employment by industry for both states relies on BLS Quarterly Census of Employment and Wages figures. We calculate the weighted average of Washington State and New York State by summing the number of jobs by industry across the states and calculating the number of jobs lost. For instance, if Washington State loses 5 of 1,000 statewide utilities jobs, and New York State loses 50 of 10,000 utilities jobs, we calculate the weighted average as 55/11,000 = 0.5 percent.

In this release we also adjust the industry-level job loss estimates by state to produce state-by-industry job loss estimates and correct for states that may have more or less employment loss owing to their differential responses to COVID-19. We use BLS Advance State Claims data, not seasonally adjusted, for the previous *n* weeks, where *n* is consistent across Washington State and New York State unemployment by industry figures and represents the number of weeks since dramatic national increases in unemployment claims began. For the April 23 update, *n = 5* and therefore counts unemployment claims beginning the week of Monday, March 16. This is a change from our previous methodology, which counted unemployment claims beginning the week of Monday, March 9. We make this change because New York State has not released data for the week of March 9. Because claims for that week represent a very small portion of all claims over the past six weeks, the difference should be minimal. For the April 30 update, *n = 6* with counts of unemployment claims beginning the same week.

We calculate the sum of unemployment claims across *n* weeks by state and use BLS Quarterly Census of Employment and Wages data as our denominator for total employment by state to remain consistent with the Washington State and New York State estimates. We then calculate estimated job loss by state.

Next, we calculate the overall job loss implied by the weighted average Washington State and New York State data by summing jobs lost and total employment across industries and dividing jobs lost by total employment. We then perform the same calculation for the state-level unemployment claims and divide the state-level implied national job loss by the industry-level implied national job loss from Washington State and New York State to derive a correction factor. For example, if Washington State and New York state imply total job loss of 13 percent, while the state level advance claims imply total job loss of 14 percent, our correct factor would be 14 percent / 13 percent = 1.077.

For each state, we calculate an adjustment factor by dividing state level job loss by Washington State and New York job loss. For example, if Alabama job loss is 14 percent, and Washington and New York state imply total job loss of 13 percent, then our adjustment factor would again be 1.077. Then, for each state, we take the weighted average industry level job loss numbers from Washington State and New York State and multiply them by the correction factor and adjustment factor. For example, if

construction job loss in Alabama was 10 percent, we would adjust it by 10 percent * 1.077 * 1.077 = 11.6 percent. The result is a state by industry job loss file. For Washington State and New York State, we do not make any adjustments and leave the state-by-industry job loss figures as reported by the state.

Finally, we apply these state-by-industry estimates to our Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (LODES) data on number of jobs earning less than $40,000 a year by industry and state to produce census tract–level estimates of low-income job loss. The number of jobs by industry and tract in a given state is multiplied by job loss by industry in that state to estimate job loss by industry at the tract level. The results by industry are summed to produce total job loss in that tract.

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The text from here through page 8 is the appendix for the April 16, 2020, release of "Where Low-Income Jobs Are Being Lost to COVID-19."

The initial estimates for this feature are based on unemployment claims from Washington State, which publishes weekly unemployment numbers by industry. To estimate the number of jobs lost by neighborhood nationwide, we apply the Washington State data on job loss by industry at all income levels to census tract–level data detailing the number of low-income jobs by industry. On our Github page, you can view the overall job loss by industry numbers used in this analysis from Washington State and the BLS.

As an example, let's say that the construction industry has lost 20 percent of its jobs at all income levels and the manufacturing industry has lost 10 percent. In a neighborhood with 100 low-income jobs, 50 of which are in construction and 50 of which are manufacturing, we estimate total job loss as (20 percent x 50) + (10 percent x 50), or 10 + 5 = 15 estimated low-income jobs lost.

We will update our estimates every week with new Washington State data through the end of April. Starting in early May, we will update every month with national unemployment numbers from the US Bureau of Labor Statistics (BLS). The BLS data will give us a better picture of net job loss (job loss and hiring) than unemployment claims alone. The data presented here represent low-income jobs, defined here as jobs with annual earnings below $40,000, and do not include all jobs. This feature does not attempt to estimate the number of low-income jobs with pay cuts.

These numbers are estimates and may not be comparable to actual low-income job loss in each neighborhood. We highly recommend interpreting these results as *relative lob loss levels*, which can be used to inform investments that alleviate some of the economic burden in hard-hit neighborhoods. In

other words, though it is more intuitive to think in total jobs, it may be better to think of a darker colored neighborhood as "worse off" than to reference the specific job loss estimated. Also note that these estimates might not apply to the seven states where shelter-in-place and/or stay-at-home orders have not been issued as of mid-April: Arkansas, Iowa, Nebraska, North Dakota, South Dakota, Utah, and Wyoming.

With these real-time best estimates, we attempt to provide the best information available to help target support to those who need it most. The data will vary from actual job loss insofar as the rate of job loss varies within industries among different income levels, or the rate of job loss differs across geographies, which is likely because different measures were implemented at different times across the country. Unfortunately, we cannot fully account for these potential effects, though we will mitigate some concerns by updating the feature with better, more representative data as they become available.

Unemployment is likely to be higher among lower-income groups—at least according to research studying job loss in the Great Recession (PDF)—so actual job loss numbers are likely greater among low-income neighborhoods than the figures estimated here. Because we do not have detailed income data available, and we do not yet have good data on job loss by income level, we do not attempt to correct for this disparity in these estimates. Rather, we recommend interpreting the areas with higher job losses as likely areas of higher need.

Unemployment may be higher or lower across states for many reasons, the most obvious of which is that states enacted different policies in response to the novel coronavirus over time. We cannot account for these regional differences until we can update this feature with better BLS national, state, and metro-level estimates in May. However, there are a few indicators that Washington State is experiencing, and has experienced, similar trends to the nation.

For example, through the weeks of March 8 to March 29, we estimate approximately 12 to 13 percent of Washington State's workforce filed for unemployment, while approximately 10 to 11 percent of the US workforce did so over the same period. Considering Washington experienced some of the first US cases and was an early adopter of mandatory closures and social distancing requirements, it is possible its residents are experiencing the economic pain slightly earlier than other areas of the country.

However, it's also possible Washington State experiences slightly higher job losses during recessions than other parts of the US, and thus our estimates are slightly inflated. For example, during 2009, we estimate that 22 percent of Washington's labor force filed for unemployment, compared with just 19 percent for the nation. And while the unemployment rate in Washington rose from 4.7 percent

to 10.4 percent between January 2008 and December 2009, it rose at a slightly lower rate—from 5.0 percent to 9.9 percent—in the country as whole over that same period.

Benchmarking Washington State unemployment claims data from March 2009, we find that the data are directionally accurate overall and for almost all industries, and that the relative levels of job loss are very similar across the two datasets, with the hardest hit industries clearly experiencing the largest job losses in both datasets (table 1). We found the largest percentage-point differences between the two in the mining, quarrying, and oil and gas extraction, construction, and manufacturing industries, in which Washington State unemployment claims data indicated much larger losses than later appeared in BLS data. On average, Washington State data tended to overstate job losses, partly because the BLS includes hires and job losses and measures net change, while unemployment claims measure only job losses. Note that the two data sources measure different time periods, and therefore results are expected to differ. The BLS collects data for a pay period that corresponds with the 12th of the month in question, while unemployment claims represent weekly updates.

The Census Bureau collects unemployment insurance records from states and integrates data from employment surveys and other data sources to create the Longitudinal Employer-Household Dynamics (LEHD) set of data products, one of which is the LEHD Origin-Destination Employment Statistics (LODES), which provide employment information at the block level in different datasets based on both worker residence and workplace location. As such, the data do not include some workers, including people in the military and many self-employed independent contractors. No federal jobs are included in this analysis as federal employment data by neighborhood are unavailable in the LODES data after 2015.

Residence Area Characteristics (RAC) data from LODES used in this analysis describe the characteristics of jobs summarized by the residence of the worker, here summarized at the census tract level. The RAC data used in this analysis reflect the most recent year of data, which is 2017 for most tracts. 2016 data are used, however, for tracts within Alaska and South Dakota and for tracts inside counties that are bordering South Dakota. Worker Area Characteristics data, which are an input for RAC, are unavailable for South Dakota and Alaska in 2017. Therefore, the tracts inside and around these two states will have undercounts. Inside South Dakota and Alaska, the undercounted reflect people that both work and live in the state. For tracts outside South Dakota, the undercounted reflect people that live outside South Dakota and work within it.

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This section was added April 23.

Benchmarking Washington Unemployment Claims Data to BLS National Unemployment

We control for total job loss differentials by using BLS advance state-level claims data, but we do not have a similar option available to account for variation across states in job loss spread by industry. Therefore, we compare job loss spread between Washington unemployment claims data and BLS national unemployment data in 2009, when both datasets are available and when states were facing considerable job losses (table 1). Because data from New York are only available beginning the week of March 21, 2020, we cannot complete a benchmark incorporating New York unemployment claims data.

TABLE 1

Benchmarking 2009 Washington Unemployment Claims Data to BLS National Employment Data

Industries	Washington unemployment claims as a share of jobs, March 2009[a]	Job difference nationally in March 2009 compared with February 2009	Percentage-point difference
Agriculture, Forestry, Fishing, and Hunting	-2.2%	-1.8%	-0.5
Mining, Quarrying, and Oil and Gas Extractions	-11.5%	-2.4%	-9.1
Utilities	-0.3%	-0.3%	0.0
Construction	-8.0%	-2.2%	-5.8
Manufacturing	-4.5%	-1.5%	-3.0
Wholesale Trade	-2.0%	-0.8%	-1.2
Retail Trade	-1.6%	-0.6%	-1.0
Transportation and Warehousing	-2.3%	-1.1%	-1.2
Information	-1.2%	-1.1%	-0.1
Finance and Insurance	-1.1%	-0.6%	-0.5
Real Estate and Rental and Leasing	-1.6%	-1.0%	-0.6
Professional, Scientific, and Technical Services	-1.6%	-0.4%	-1.3
Management of Companies and Enterprises	-0.1%	-0.7%	0.6
Administrative and Support and Waste Management and Remediation Services	-3.0%	-1.3%	-1.8
Educational Services	-0.2%	-0.2%	-0.1
Health Care and Social Assistance	-0.7%	0.1%	-0.8
Arts, Entertainment, and Recreation	-1.0%	-1.3%	0.3
Accommodation and Food Services	-1.3%	-0.4%	-0.9
Other Services	-1.1%	-0.2%	-0.9
Public Administration	-0.7%	0.5%	-1.2

Sources: Washington Unemployment Claims data, BLS Quarterly Census of Employment and Wages, and BLS Current Employment Statistics Data.

[a] Number is represented as negative to indicate job loss.

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For more information on this project, see https://apps.urban.org/features/covid-jobloss-feature/.

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