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The Pandemic Misery Index

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SUMMARY



The Covid-19 pandemic has brought with it both human and economic loss. Here we discuss our Pandemic Misery Index, or PMI, a simple metric that combines the unemployment rate with the number of deaths per 10,000 people. The PMI borrows from Arthur Okun’s Misery Index from the 1970s that combined the unemployment rate and the inflation rate.

The PMI can be calculated for states and metropolitan statistical areas, or MSAs. We discuss two variants of the PMI.

The first is based on average unemployment rates from the start of the pandemic in March and the cumulative number of deaths per 10,000 up to the month under consideration. This form of the PMI captures the cumulative human and economic loss since the start of the pandemic. As of December 2020, New Jersey and New York had the highest PMIs at 32.4 and 30.7 respectively. Vermont had the lowest PMI at 9.0 and Utah’s 9.3 was second lowest in December.

The second variant of the PMI tracks an area’s monthly unemployment rate and death rates relative the total range of these two metrics over the course of the pandemic. This form of the PMI, the Relative Pandemic Misery Index, or RPMI, captures how an area is faring at a point in time relative to the hardest hit months of the pandemic. For example, New York had high initial values of this monthly index, but its values have declined since. In contrast, North and South Dakota had low initial RPMI values, but their values have risen in recent months.

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THE PANDEMIC MISERY INDEX

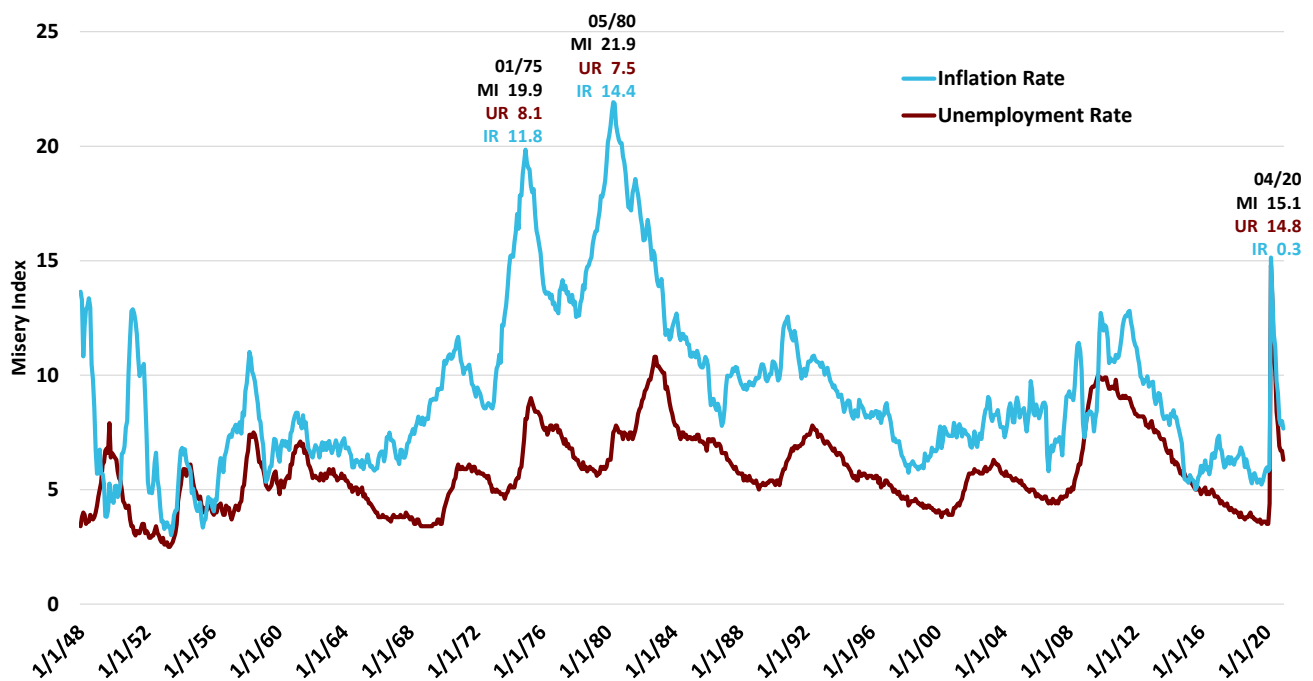
INTRODUCTION

Which states have been the most effective in dealing with Covid-19? Which states have done better at stemming the spread of the virus and keeping businesses afloat? The answer to these questions depends on how we define and measure ‘effectiveness.’ As shelter-in-place orders began, many states’ goals were to protect vulnerable populations and minimize deaths, while maintaining economic activity and employment levels. National, state, and local officials have had to navigate these two competing objectives as the pandemic has progressed since the first community spread cases were reported in in early 2020.

Here we discuss our Pandemic Misery Index or PMI. The concept is borrowed from Arthur Okun’s misery index from the 1970s. The original Misery Index combines the unemployment rate and the annual inflation rate. The 1970s were a period of high unemployment rates and high inflation rates. The 1970s and 1980s both began with recessions with another recession sandwiched in between. The term “stagflation” was coined to describe the slow growth and high inflation rates of this period. The recession in 1974-1975 was triggered in part by OPEC’s embargo of oil shipments to the United States and other countries resulting rise on oil prices over the course of the decade.

Okun’s Misery Index was popularized by Ronald Reagan in his campaign against Jimmy Carter, though Carter had first used the Misery Index during his campaign against Gerald Ford. Figure 1 depicts the Misery Index from January 1948 to January 2021.

Figure 1. Misery Index



Notes: Monthly inflation rate is the annual change in the CPI-U from the same month in the previous year based on the seasonally adjusted series. Unemployment rate is seasonally adjusted.

The two peaks in 1975 and 1980 illustrate the magnitude of the index’s components. During Gerald Ford’s presidency, the January 1975 Misery Index was 19.9 based on an unemployment rate of 8.1%

and an inflation rate over the previous year of 11.8%. During the last year of Jimmy Carter's presidency, the May 1980 Misery Index reached its highest mark of 21.9 - a result of an unemployment rate of 7.5% and an inflation rate of 14.4%. The Misery Index reached 15.1 in April 2020 primarily due to the 14.8% unemployment rate and a 0.3% inflation rate. The unemployment rates in April to June of 2020 were higher than any of the monthly unemployment rates since January 1948.

In a 1999 *Newsweek* article, Robert Barro introduced a variant of the Misery Index, coined the Barro Misery Index that combines changes in inflation, unemployment rates, long run interest rates and the degree to which GDP growth falls short of or exceeds expectations. He used these changes to compare periods within different presidents' administrations. Our PMI follows these other misery indexes to capture the simple idea that the state of the economy and the severity of the pandemic affect the well-being of the populace.

PANDEMIC MISERY INDEX – STATES

In its most basic form, the PMI is the simple addition of the average unemployment rate in a state or MSA and the total number of deaths per 10,000. Figure 2 depicts the PMI for each state. Covid-19 fatalities relative to the population are used as one indicator of public health effectiveness, with a lower fatality rate indicating greater effectiveness. The unemployment rate serves as a measure of economic health, with lower unemployment rates indicating higher economic effectiveness. How to balance the health risk and the economic risk, how to weigh these two often conflicting goals in making policy decisions, are difficult issues that each state has had to face. As was true of the original Misery Index, the basic form of the Pandemic Misery Index is a simple approach that weighs these two features equally.

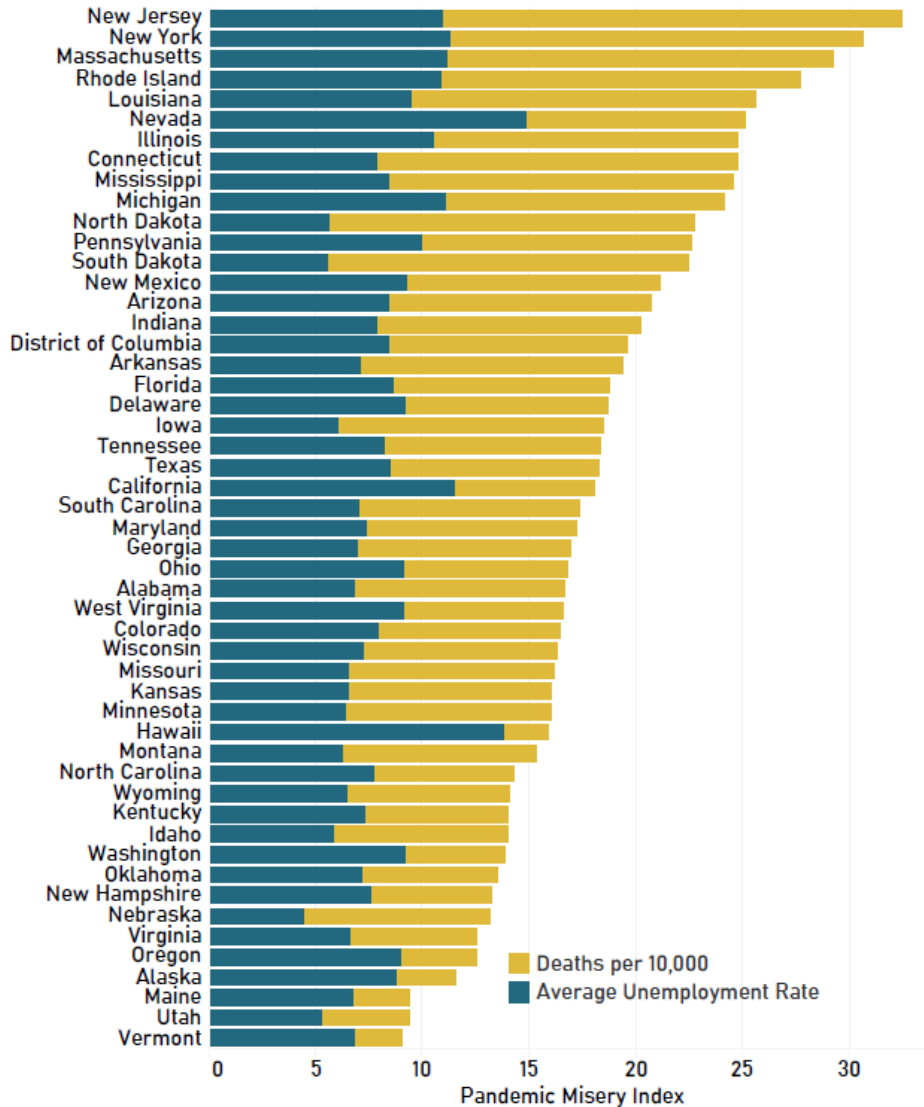
The PMI is intended to give an overall measure indicating the health and economic impact of the pandemic. Clearly no state or metropolitan statistical area has complete control over the health of its population or its economic condition. There are no levers for a state governor to pull that will automatically raise or lower these measures. In addition, these two measures are related. Ordering businesses to close will raise the unemployment rate in the near term, almost immediately as we saw last spring, while also lowering infection rates and, it is hoped, eventually lowering death rates. Implicit in the above statements, there are many exogenous factors that impact unemployment rates and pandemic death rates. These include industry mix (certain industries were much more impacted by the pandemic and by government responses to the pandemic), pre-pandemic population health (certain states have higher obesity rates than others), and general conditions such as population density and climate (certain states are in geographies more conducive to outside activity). Further, individuals' behaviors in response to the pandemic have varied across and within states. Even during the crisis, economic events differentially impacted states. The decline in global oil prices, partly in response to the pandemic, certainly led to higher unemployment in areas that have a relatively high percent of the economy in the oil and gas industry. Thus, the PMI gives a general characterization of what an area has experienced during the pandemic, experiences that have been influenced by policy, but which are subject to numerous influences apart from policy. That is, the PMI cannot indicate causation.

In Figure 2, deaths per 10,000 people reflect the cumulative deaths from March 2020 to December 2020 and the unemployment rate is the average rate over the same months. As shown in Figure 1, there is a wide range of experiences with both the unemployment rate and the death rate during the pandemic.

Some states have been hard hit with both high unemployment rates and high death rates, while some have had low rates on both measures.

At the top of the scale, New Jersey's PMI was 32.44 with cumulative deaths per 10,000 at 21.44 and an average unemployment rate of 11%. Vermont had the lowest PMI of only 9.04. The cumulative death rate per 10,000 in Vermont was 2.18 and the average unemployment rate was 6.86. Vermont's PMI was less than a third of New Jersey's.

Figure 2. Pandemic Misery Index



Pandemic Misery Index=March to December 2020 average unemployment rate + ((March to December 2020 total deaths/population)*10,000) Sources: COVID-19 deaths from the New York Times, unemployment rates from the Bureau of Labor Statistics, 2019 population estimates from the Census Bureau.

Among the four most populous states, New York had the highest PMI at 30.65 based on a cumulative death rate per 10,000 of 19.31 and an average unemployment rate of 11.34%, followed by Florida with a PMI of 18.78, an average unemployment rate of 8.69% and a cumulative death rate of 10.09. Texas had the third highest PMI at 18.24 based on an average unemployment rate of 8.53% and a 9.71 death rate. California had the fourth highest PMI among the four most populous states at 18.08. The average unemployment rate in California was 11.51% and the cumulative deaths were 6.57 per 10,000 residents.

New York faced its biggest test early in the pandemic, and its decisions and experiences have been instructional to others. Medical and health care professionals and policy makers are better able to handle cases today in part because of the experience of New York. California, Texas, and Florida have similar PMIs but have contrasting unemployment rates and death rates over the entirety of the pandemic period thus far. The unemployment rates in Texas and Florida have been lower than in California, but California has had a lower death rate.

The two components of the PMI are plotted in Figure 3. The average unemployment rate from March to December 2020 is identified on the horizontal axis and the March to December 2020 cumulative death rate is identified on the vertical axis. Hawaii has certainly achieved a low fatality rate, but at the cost of massive unemployment. Only Nevada’s 14.9% average unemployment rate is higher than Hawaii’s 13.9%. In contrast, North and South Dakota had low average unemployment rates, but high cumulative death rates. During the spring and the summer of 2020, North and South Dakota had low death rates, but beginning in October through December, the two states had the highest death rates in the country.

Figure 3. Average Unemployment and Deaths per 10,000 by State (March to December 2020)

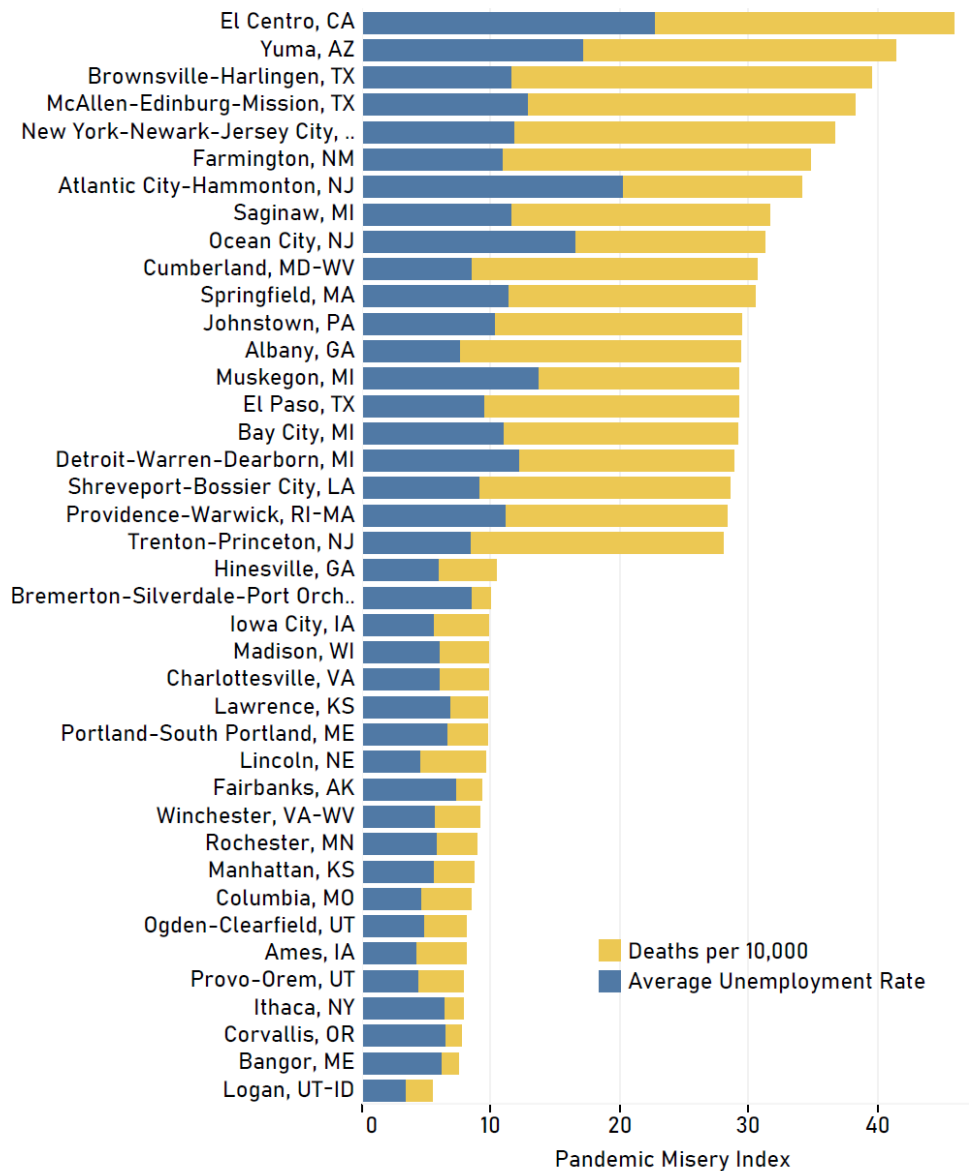


March to December 2020 average unemployment rate and March to December 2020 total deaths per 10,000. Sources: COVID-19 deaths from the New York Times, unemployment rates from the Bureau of Labor Statistics, 2019 population estimates from the Census Bureau.

From Figure 2, note that Vermont, Utah and Maine had the three lowest PMIs. Utah’s PMI of 9.33 is a close second to Vermont’s 9.04 and only marginally lower than Maine’s PMI of 9.35. However, its average unemployment rate was lower at 5.3% than the rates in the two New England states, while its death rate was higher at 3.96.

PANDEMIC MISERY INDEX – METROPOLITAN STATISTICAL AREAS

Pandemic Misery Index values can also be calculated for metropolitan statistical areas. Figure 4 presents results for select MSAs with the highest and lowest PMIs. The El Centro MSA, located in southern California along the border with Mexico, held the highest PMI value at 45.9. This value is based on an average unemployment rate of 22.8%, the highest among U.S. metropolitan areas, and 23.1 cumulative deaths per 10,000 people. The lowest PMI value was captured by the Logan MSA, which spans the Utah / Idaho border and, at 5.5, is 12% of the El Centro PMI value. Logan’s average unemployment rate was the lowest among MSAs at 3.5% and had one of the lowest coronavirus death rates at 2.0 deaths per 10,000 people.

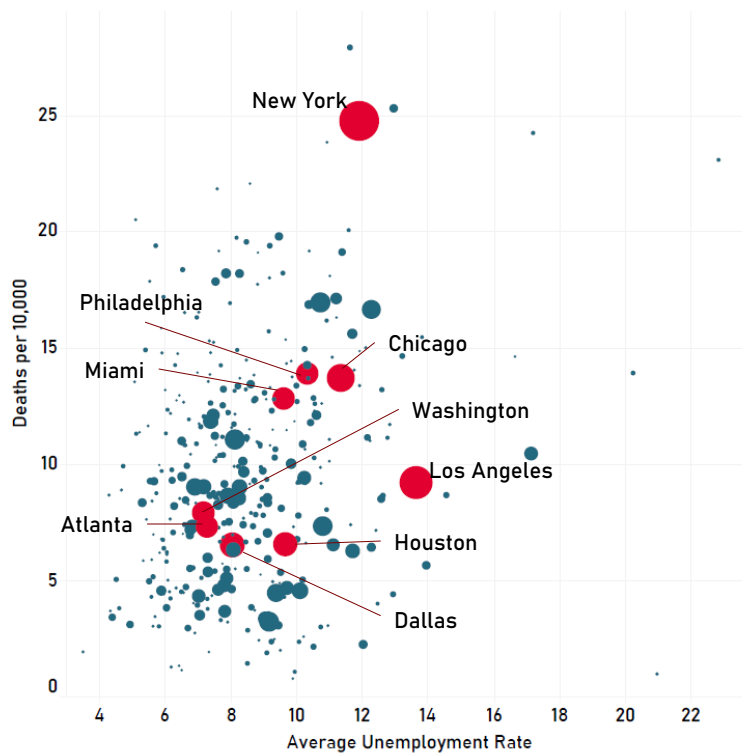


Pandemic Misery Index=March to December 2020 average unemployment rate + ((March to December 2020 total deaths/population)*10,000) Sources: COVID-19 deaths from the New York Times, unemployment rates from the Bureau of Labor Statistics, 2019 population estimates from the Census Bureau.

MSAs with low PMI values tend to be smaller in population and more geographically remote. For the U.S., many of the MSAs with high PMI values are in higher-population MSAs in the northeast and southwest. New England states see a wide range of PMI values and wide combinations of unemployment rates and death rates. In general, MSAs on the west coast have relatively low deaths per 10,000, but a wide range of unemployment rates, including some that are at the high end of the range. If we restrict our attention to Texas, the MSAs that make up the Rio Grande Valley, Brownsville-Harlingen and McAllen-Edinburg-Mission, reported high PMI values. With a value of 11.4, Austin-Round Rock-Georgetown had the lowest PMI in Texas.

The scatter plot in Figure 5 reveals a variety of outcomes among both large and small MSAs. The size of the circles in the scatterplot reflect the population of the MSAs, and those represented in red are the MSAs with populations more than 5 million residents. The largest among these MSAs, New York-Newark-Jersey City has a PMI of 36.7, based on an average unemployment rate of 11.9% and 24.8 deaths per 10,000 people. At 14.6, Dallas-Fort Worth-Arlington has the lowest PMI of the large MSAs with an average unemployment rate of 8.0% and 6.6 deaths per 10,000 people. The PMI for DFW is lower than that of many smaller MSAs.

Figure 5. Average Unemployment and Deaths per 10,000 by MSA (March to December 2020)



March to December 2020 average unemployment rate and March to December 2020 total deaths per 10,000. Sources: COVID-19 deaths from the New York Times, unemployment rates from the Bureau of Labor Statistics, 2019 population estimates from the Census Bureau.

Other large MSAs had a variety of experiences. The second largest, Los Angeles-Long Beach-Anaheim, had a PMI value of 22.9 (average unemployment rate 13.6%, death rate 9.3 per 10,000). The third largest, Chicago-Naperville-Elgin, had a PMI of 25.1 (unemployment 11.3%, death rate 13.8). The fourth largest MSA is Dallas-Fort Worth-Arlington. Houston-The Woodlands-Sugar Land ranked fifth with a

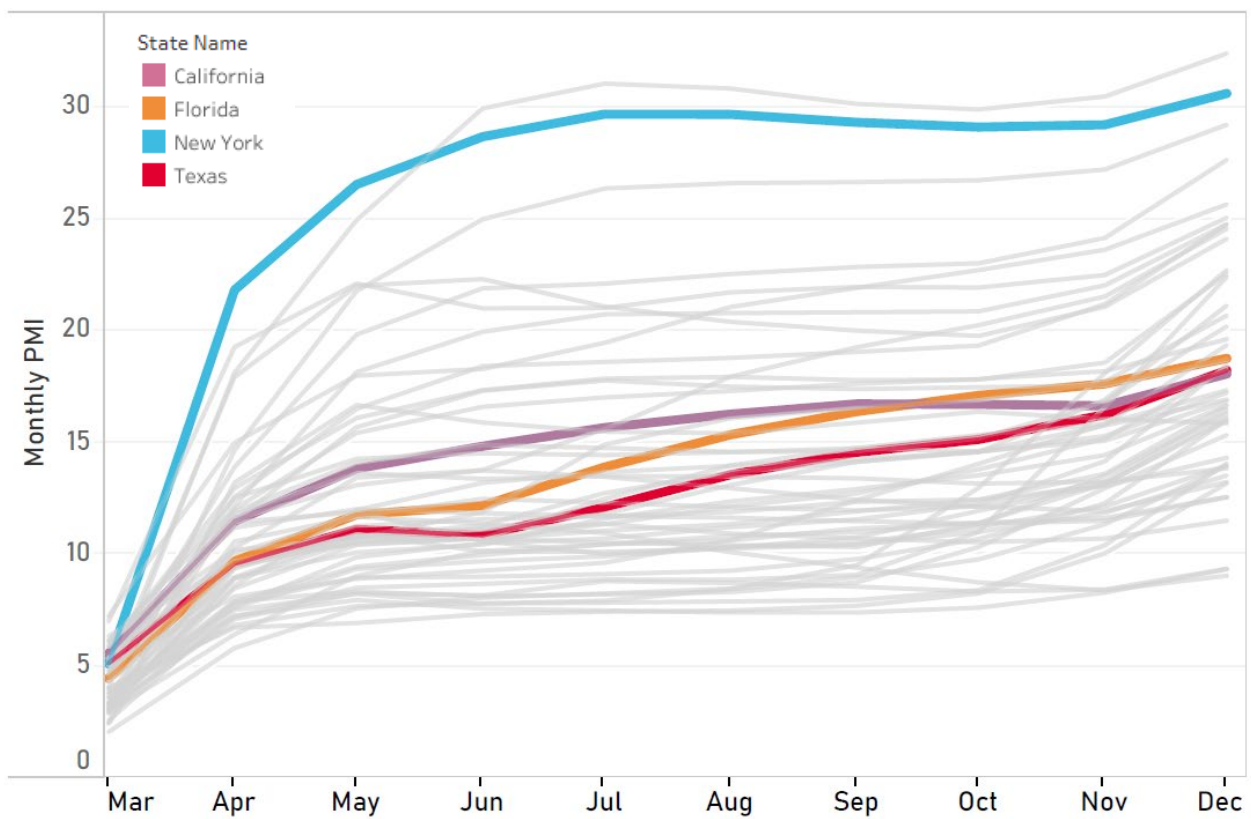
PMI of 16.2 (unemployment 9.6%, death rate 6.6). Other large MSAs include Miami-Fort Lauderdale-West Palm Beach, with a PMI of 22.4 (unemployment 9.6%, death rate 12.9), Philadelphia-Camden-Wilmington with a PMI of 24.2, Washington, DC with a PMI of 15.09 and Atlanta-Sandy Springs-Alpharetta with a PMI of 14.6.

Clearly, the PMIs for each state and MSA will continue to change as time passes, and rankings will change as a result. Unemployment rates, while generally declining, are affected by public policy decisions and industry mix of each state or MSA, in addition to public health restrictions. Cumulative deaths are growing at different rates across states and MSA, and some areas that had low death rates in the early months of the pandemic have seen rapid increases in these rates in the latter months of 2020.

THE CUMULATIVE PANDEMIC MISERY INDEX OVER TIME

As discussed above, the basic PMI is a cumulative index in that the unemployment rate is averaged over the months beginning with March 2020 up to the most recent available monthly unemployment rate and the deaths per 10,000 include all deaths beginning in March 2020 up to the same month. Figure 6 illustrates how the PMI values for the states have evolved over time. The monthly values reflect the addition of the average monthly unemployment rate and the cumulative deaths per 10,000 from March 2020 to the month identified on the horizontal axis. A series for each state is depicted, but only the four most populous states are highlighted.

Figure 6. Cumulative PMI March – December 2020

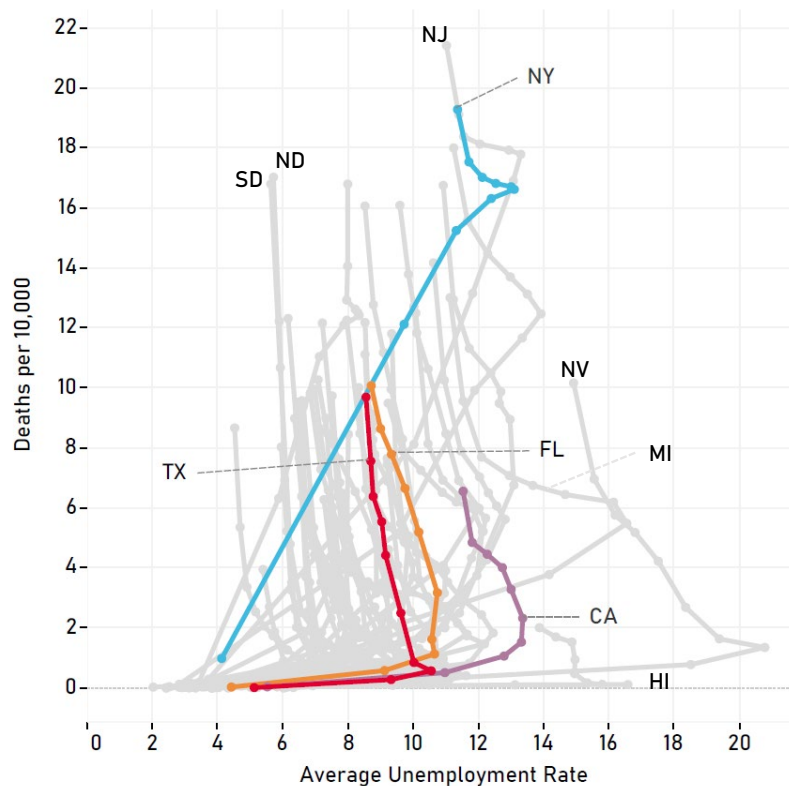


PMI=Cumulative average unemployment rates + cumulative deaths per 10,000, March to each month between March and December 2020. Sources: COVID-19 deaths from the New York Times, unemployment rates from the Bureau of Labor Statistics, 2019 population estimates from the Census Bureau.

New York's PMI rose rapidly in April due to the high death rate that month. Its PMI flattened by June as additional deaths per month declined dramatically and its unemployment rate declined. California's PMI also rose rapidly initially, but this was primarily the result of increasing unemployment rates, not a rapid increase in deaths. The PMIs in Texas and Florida have increased more rapidly than in the other two states since June of 2020 due to higher additional deaths per month. With this formulation of the PMI, cumulative deaths per 10,000 can only increase or remain constant through time, but the average unemployment rate can decline as economic conditions improve.

The monthly combinations of the average unemployment rates and the cumulative deaths per 10,000 are depicted in Figure 7. Again, a series for each state is shown with the four largest state highlighted. The first set of coordinates for each series reflects the values in March of 2020 and the terminal values are for December 2020. New York's experience is distinguished from the other three large states with its rapid increase in the deaths between March and April combined with the increase in its unemployment rate. California's substantial initial rise in its average unemployment rate distinguishes it from Texas and Florida.

Several other states are also identified in the figure. North and South Dakota have had relatively low unemployment rates for the course of the pandemic, but their cumulative death rates have risen rapidly from October to December. The series shown for Nevada, Michigan, and Hawaii are distinct in the unemployment rate dimension. The average unemployment rate reached 20.8% in Nevada, 16.6% in Hawaii, and 16.5% in Michigan by May 2020.

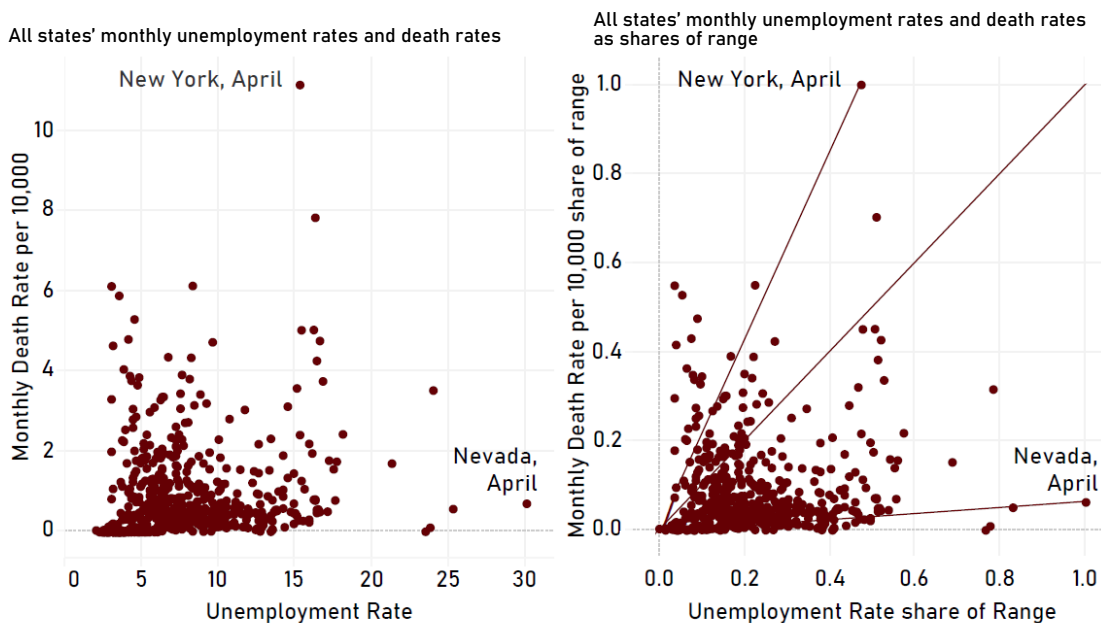


Cumulative average unemployment rates and cumulative deaths per 10,000, March to each month between April and December 2020. Sources: COVID-19 deaths from the New York Times, unemployment rates from the Bureau of Labor Statistics, 2019 population estimates from the Census Bureau.

THE RELATIVE PANDEMIC MISERY INDEX OVER TIME

Thus far we have discussed the PMI as a cumulative index with the calculation of cumulative deaths and average unemployment rates from the beginning of the pandemic to the month of evaluation. The cumulative index provides a metric of economic and human stress over the entire period for which it is calculated. However, as the monthly death rates and unemployment rates have changed since March 2020, a monthly PMI is indicative of the “misery” at a point in time like Okun’s original Misery Index. Simply adding the monthly death rate per 10,000 to the unemployment rate presents a scaling issue. This is addressed by creating an index that tracks how a state’s monthly unemployment and death rates compare to the range of unemployment and death rates over the course of the pandemic.

For example, the monthly unemployment rates across all states from March 2020 to December 2020 ranged from North Dakota’s March unemployment rate of 2% to Nevada’s April rate of 30.1% for a range of 28.1 percentage points. The monthly deaths per 10,000 ranged from 0 to 11.15 per 10,000 for a range of 11.15 percentage points. There were no Covid-19 deaths in Wyoming in March and none in Vermont in September and October. The highest number of deaths per 10,000 was 11.15 in April for New York. The graph on the left in Figure 8 depicts all of the state-by-month unemployment rate and deaths per 10,000 combinations from March 2020 to December 2020. Most of the combinations fall below an unemployment rate of 18% and monthly deaths of less than 6 per 10,000 residents.



Sources: COVID-19 deaths from the New York Times, unemployment rates from the Bureau of Labor Statistics, 2019 population estimates from the Census Bureau.

Using each state’s monthly unemployment rate in combination with the overall range of the unemployment rate, we define the following:

$$URF_{it} = (UR_{it} - \min(UR_{1,3}, \dots, UR_{51,12})) / (\max(UR_{1,3}, \dots, UR_{51,12}) - \min(UR_{1,3}, \dots, UR_{51,12}))$$

where URF_{it} is state i ’s unemployment rate fraction of the unemployment rate range in month t . UR_{it} is state i ’s unemployment rate in month t . $\max(UR_{1,3}, \dots, UR_{51,12})$ and $\min(UR_{1,3}, \dots, UR_{51,12})$ are the

maximum and minimum unemployment rates across the 50 states and the District of Columbia between March 2020 and December 2020.

Similarly, each state’s monthly number of deaths per 10,000 in combination with the overall range of deaths per 10,000 define:

$$DRF_{it} = (DR_{it} - \min(DR_{1,3}, \dots, DR_{51,12})) / (\max(DR_{1,3}, \dots, DR_{51,12}) - \min(DR_{1,3}, \dots, DR_{51,12}))$$

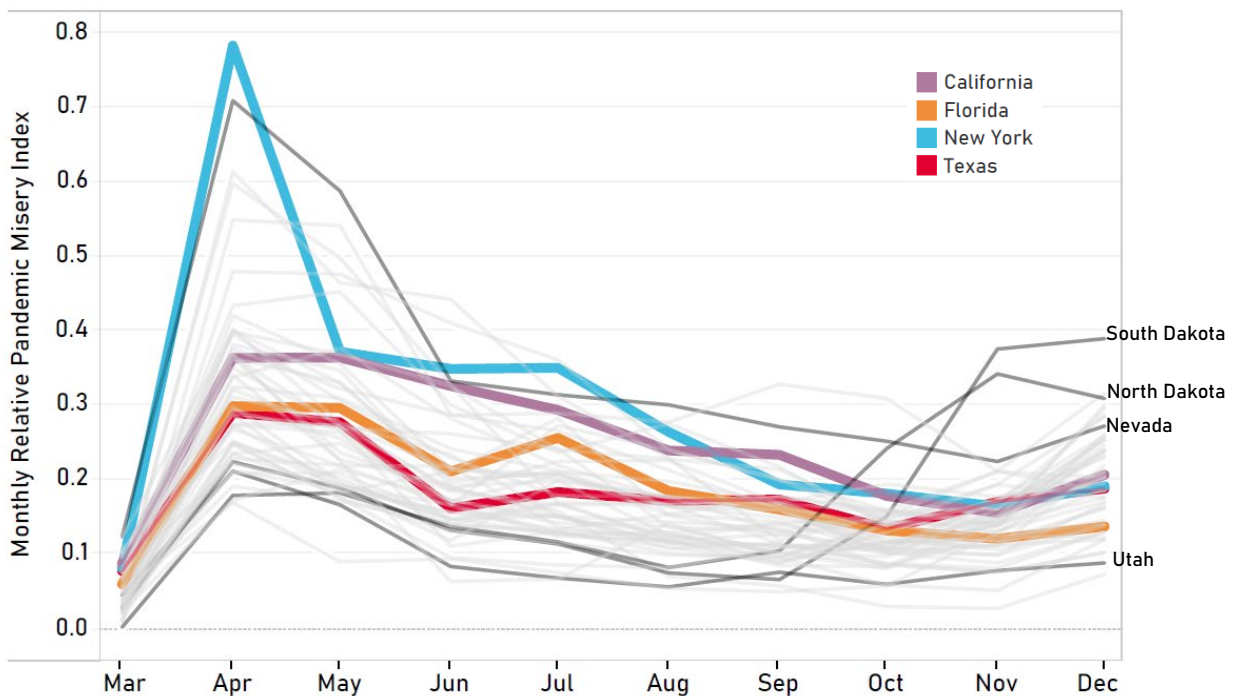
where DRF_{it} is state i ’s deaths per 10,000 share of the range of death rates in month t . DR_{it} is state i ’s deaths per 10,000 in month t . $\max(DR_{1,3}, \dots, DR_{51,12})$ and $\min(DR_{1,3}, \dots, DR_{51,12})$ are the maximum and minimum unemployment rates across the 50 states and the District of Columbia between March and December.

With these transformations, each state-by-month observation is now on a scale of 0 to 1. The rescaled values are depicted in the graph on the right side of Figure 8. The length of the ray from the origin to each coordinate can be translated into a 0 to 1 metric that measures a ray’s length as a fraction of the maximum possible ray from the origin to the coordinate (1,1), or:

$$RPMI_{it} = (((URF_{it})^2 + (DRF_{it})^2)^{0.5} / 2^{0.5}).$$

The Relative Pandemic Misery Index or RPMI for each state measures how each state’s monthly unemployment rates and deaths per 10,000 compare to the ranges of these two variables.

Figure 9 depicts the RPMI from March to December 2020 for all of the states, again with the four most populous states highlighted.



Sources: COVID-19 deaths from the New York Times, unemployment rates from the Bureau of Labor Statistics, 2019 population estimates from the Census Bureau.

In April, New York’s monthly index rose to 0.78 and then fell to 0.37 by May. Its relative index continued to decline until November and then rose slightly in December for an a final value of 0.19.

California's RPMI rose to 0.37 by May and then declined until November. In December its value was 0.21. Florida highest RPMI was in May at 0.30, just slightly higher than its April value. Its December value was the lowest among the four most populous states at 0.16. Texas had the lowest RPMI among these four states between April and August; its December value was also 0.19.

As the series in Figure 9 indicate, the relative position of the four most populous states have improved since the hardest-hit months of April and May. Other states have seen an increases in this index in the more recent months. The index values for North Dakota and South Dakota increased during the fall. In December, South Dakota's RPMI value was 0.39 and North Dakota's was 0.31. Nevada's average monthly RPMI value was the highest among the states at 0.34 and Utah's was the lowest at 0.09.

CONCLUSION

The COVID 19 pandemic has brought with it both human and economic loss. Here, we have introduced the Pandemic Misery Index that combines the unemployment rate with the number of deaths per 10,000 people. We outlined and discussed two variants of the PMI.

The first variant is based on average unemployment rates from the start of the pandemic in March and the cumulative number of deaths per 10,000 up to the month under consideration. Covid-19 fatalities relative to the population provide an indicator of public health effectiveness and the unemployment rate serves as an indicator of economic health. Throughout the pandemic, state and local officials have had to balance public health and economic health in each of their decisions. The PMI captures the cumulative human and economic loss since the start of the pandemic. As of December 2020, New Jersey and New York had the highest PMIs at 32.4 and 30.7, respectively. Vermont had the lowest PMI at 9.0 and Utah's 9.3 was second lowest in December.

The second variant of the PMI tracks an area's monthly unemployment rate and death rate relative the total range of these two metrics over the course of the pandemic. This form of the PMI, the Relative Pandemic Misery Index, or RPMI, captures how an area is faring at a point in time relative to the hardest hit months of the pandemic. For example, New York had high initial values of this monthly index, but its values have since declined. In contrast, North and South Dakota had low initial RPMI values, but have recently increased.

Regardless of which form of the index is employed, both provide an indication of how a state or MSA has fared in terms of public health and economic effectiveness.