

Economic Analysis Of Unemployment Rates and Opioid Overdose Rates in the United States

The opioid crisis has been one of the most significant health crises in the United States within the 21st century. Simultaneously, the US has seen many rises and dips within the economy, with the low points reaching recession levels. There was intrigue to see whether periods of economic disparity, in this case quantified by unemployment rate, coincided with spikes in opioid overdose rates. Do people sink into addiction when (economically) it seems like there is no light at the end of the tunnel? The goal was not to determine causality but to explore whether economic trends are indicative of opioid mortality. This question is data-driven and has relevant implications for the intersection of economics and public health.

The analysis used two publicly available datasets. The first was the monthly national unemployment rate in the United States from 1999-2020. This data comes from the source FRED, Federal Reserve Economic Data. To make this dataset easier to use with our next set, it was cleaned by converting the date column to a datetime variable and extracting the year to create a yearly unemployment rate.

The second set was drug overdose death rates via CDC Wonder from Our World In Data. The data all-in-all contains annual overdose rates per 100,000 people for several different classifications of drugs in countries all across the world. For this study's purposes, only the variables "Any opiate death rates" and "United States" were necessary. So, the dataset was cleaned by filtering for the US and opioid variables. It also spans from 1999-2020, which is a possible limitation on the dataset. Since the opioid crisis spiked and its prominence stayed during and after the COVID pandemic in 2020, it would have been better to find a dataset that included after 2020. Unfortunately, there were limited reliable sources with such information.

After merging the two datasets, surprisingly, there was no clear trend between unemployment rates and opioid overdoses in that 22-year period of time. Unemployment peaked in 2010-2011 (following the great recession and housing crisis) and again during the 2020 COVID pandemic, showing that this data behaves cyclically. On the other hand, opioid rates rose steadily across the period, with an increase starting in 2014, likely due to the rise of synthetic opioids like fentanyl. The scatterplot shows no clear upward or downward trend between the two variables either, suggesting their patterns do not move together.

A simple Ordinary Least Squares regression was used to predict the relationship between unemployment rates and opioid overdoses. The model structure is:

$$\text{OpioidOverdoses} = \beta_0 + \beta_1 \cdot \text{UnemploymentRate} + \epsilon$$

β_0 is the baseline overdose rate when unemployment is zero (not realistic because unemployment will never be zero). β_1 is the estimated change in opioid overdoses per 100k population for every 1 point change in unemployment. ϵ is the error term. The model is limited because it cannot predict non-economic influences in the opioid epidemic, such as synthetic opioids and other socio-political variables. It also does not follow real-world trends when unemployment rates reach below the standard unemployment rate in the US.

The slope of the OLS line (β_1) was found to be 0.12, which is essentially a flat line on the graph. This suggests there is no linear relationship between the two variables. The p-value for this model was 0.842, which is very large, much larger than even the 10% significance level, indicating that the relationship is also not statistically significant. Lastly, the R^2 value was 0.002, meaning that unemployment only contributes to about 0.2% of change within opioid overdose rates. Clearly, the independent variable of unemployment rate does not influence opioid overdoses as much as predicted.

To summarize, this project examined whether variations in opioid overdoses are associated with levels of unemployment. After acquiring data from FRED and Our World In Data and combining it into a consistent dataset, summary statistics and correlation analysis were applied. The evidence indicates that unemployment rates and opioid overdoses were almost completely unrelated over this time period. The correlation is near-zero and the regression model finds no significant relationship. Overall, unemployment rates are not a good predictor of opioid overdoses in the United States. Future research could include more detailed state-level data, additional socioeconomic variables, and models of prescription vs synthetic opioids to further investigate.

Sources

“Drug Overdose Death Rate by Drug Type.” *Our World in Data*, ourworldindata.org/grapher/drug-overdose-death-rates. Accessed 12 Dec. 2025.

“Unemployment Rate.” *FRED*, 20 Nov. 2025, fred.stlouisfed.org/series/UNRATE.