The East-West Divide of the U.S. Fentanyl Crisis: Extended abstract[1]

There were about 285,000 deaths related to opioids between 2019 and 2022 in the United States. Of these deaths, nearly 85 percent involved synthetic opioids like fentanyl. By contrast, between 2009 and 2012 the total number of opioids-related deaths was about 90,000, of which only roughly 10 percent involved synthetic opioids.

What are the causes of the increase in mortality related to fentanyl? A literature focusing on *prescription opioids* has found that changes in the supply of prescriptions help explain variation in mortality in the 2000s and early 2010s, see, e.g., Currie and Schwandt (2020), Alpert et al. (2021), Maclean et al. (2022) and Cho et al. (2021). But less is known about the geographic variation in the supply of fentanyl and associated mortality: why did some communities in the U.S. have much faster and sharper increases in fentanyl mortality than others? And what is the link between rising fentanyl mortality and secular declines in economic opportunities related to international trade and automation, particularly in the manufacturing industry?

In this paper, we first document a novel explanation for the geographic variation in fentanyl mortality. We document a sharp east-west discontinuity near the Mississippi river in mortality that is linked to historical differences in types of heroin—black tar in the west vs powder in the east. Because of their physical form, fentanyl is more commonly mixed with powder than with black tar heroin. Correspondingly, the adoption of fentanyl was much faster in the eastern United States. Second, we revisit in a regression framework the association between fentanyl mortality with both job losses in manufacturing as well as exposure to international trade, using similar data as in Charles et al. (2018) and Moore et al. (2023). We find that the associations with manufacturing job losses and trade exposure are much weaker when including an east-west geographic indicator proxying for historical differences in type of heroin. These findings suggest that studies of the causes of fentanyl mortality should include an east-west geographic indicator, to avoid omitted variable bias related to type of heroin.

Our analysis begins with data on the type of heroin consumed across major U.S. cities from the Drug Enforcement Agency's (DEA) Heroin Domestic Monitor Program (HDMP). HDMP data are based on DEA retail-level purchases of heroin, and are the main source of data on type, price, and purity of heroin across almost 30 of the largest U.S. cities. At least since the early 1990s, cities to the west of the Mississippi river have relied almost exclusively on

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black tar heroin originating from Mexico. In contrast, eastern cities have exclusively relied on powder heroin originating from various sources.[2] Globally, most heroin is in powder form and transported by air; the exception is black tar heroin (which is heavier in weight and volume relative to the powder form) found in the western U.S. and transported by land from the southern border (Ciccarone (2009)). Discussing earlier health implications, Ciccarone and Bourgois (2003) argued that the spread of HIV was slower in the west in the 1980s and 1990s, as black tar users have to flush/unclog syringes and use more heat than users of powder heroin.

The HDMP data confirm the mentions in DEA and Center for Disease Control and Prevention (CDC) reports and in newspaper articles of a divide in the geographic distribution of black tar heroin near the Mississippi river: black tar is the most common type of heroin west of the river and is largely absent east of the river.[3] In our baseline analysis, we take east and west definitions from the U.S. Census, which coincide closely with the black tar heroin split observed in the HDMP data.[4] We calculate state and county-level death rates as the ratio of the count of deaths related to opioids using the CDC's National Vital Statistics System's Multiple Cause of Death to population counts from the U.S. Census. Finally, we also use counts of drug seizure reports containing fentanyl from the DEA's National Forensic Laboratory Information System (NFLIS). These data are submitted by state and local forensic laboratories after analyzing drugs seized by law enforcement agencies.

As a starting point, we first group the 48 contiguous U.S. states into east and west groups. Prior to 2013, both the levels and trends in death rates related to prescription opioids and heroin were similar in east and west, suggesting similar consumption of licit and illicit opioids throughout the 2000s and early 2010s. Around 2013, coinciding with the surge in fentanyl production abroad (Miller 2020 and Pardo et al. 2019), deaths related to synthetic opioids surged in the east relative to the west, as fentanyl was more commonly mixed with powder than with black tar heroin. Fentanyl drug seizures by the DEA also surged in the east. The DEA's 2015 National Heroin Threat Assessment report mentioned: "Most of the areas affected by the fentanyl overdoses are in the eastern United States, where white powder heroin is used, because fentanyl is most commonly mixed with white powder heroin or is sold

[2]In recent years, Mexican cartels have begun distributing powder heroin as well as black tar heroin. Still, it remains the case that black tar heroin remains largely absent in the east and is the most common type of heroin found in the west; see the 2016 Heroin Domestic Monitor Program.

[3]See for example New York Times June 5, 2017: Drug Deaths in America Are Rising Faster Than Ever.

[4]The Census defines eastern states as those in the eastern divisions: East North Central, East South Central, South Atlantic, Middle Atlantic, and Northeast. See Census Regions and Divisions of the United States for more detail.

disguised as white powder heroin." Eventually, in the late 2010s, fentanyl became increasingly mixed with non-opiods like cocaine and methamphetamine. As fentanyl broadened, mortality stepped up across the nation, with many deaths possibly accidental.[5] Still, a strong gap in mortality between east and west has remained.

We quantify the east-west gap in mortality in the cross-section of about 3,000 U.S. counties. In the baseline, the dependent variable is the average death rate related to any opioids or synthetic opioids from 2018 to 2022. We also consider different specifications where we look at death rates in other periods and involving other drugs. The main explanatory variable of interest is an indicator variable equal to 1 in the east and equal to zero in the west, employing U.S. Census definitions. We control for various demographic, health, and economic characteristics that could be related to mortality, including death rates during the 2000s, to ensure our estimates are not merely reflecting generally higher opioid or other drug use.[6] On its own, the east-west indicator explains about 20 percent of the variation in mortality across counties from 2018 to 2022. Conditional on various county characteristics, we estimate that counties in the east had about 10 more deaths per 100,000 persons from 2018 to 2022. In relative terms, deaths were higher by about 65 percent. The coefficient estimate is similar with or without county controls. We also show that all of the Census divisions east of the Mississippi have higher death rates than all of the western divisions. Finally, we use yearly data to estimate the annual east-west gap in mortality.[7] We confirm that the gap was essentially zero throughout the 2000s and early 2010s. The gap then surged around 2013 and peaked in 2017. In levels, the gap has plateaued a touch above 10 deaths per 100,000, while in relative terms the gap fell from about 120 percent in 2017 to 55 percent in 2022, as fentanyl spread beyond heroin and into other drugs like cocaine and methamphetamine.

Where geographically does the east-west gap in mortality take place? Is there a discontinuity in mortality near the Mississippi river, consistent with the discontinuity in black tar heroin? At first glance, it is not clear why the river would represent a fixed boundary in heroin

[5]See, e.g., WSJ 2022: Three New Yorkers Ordered Cocaine From the Same Delivery Service. All Died From Fentanyl. In a survey of opioid overdose survivors, nearly half reported they did not intend to consume fentanyl or other opioids (Bazazi et al. 2024).

[6]Specifically, we include as controls average death rates related to any opioids and cocaine from 2000 to 2009; the 2000 share of the population that is non-Hispanic white, with a college degree, and aged 25-54; median household income; population; share of veteran population; doctors and hospitals per capita; and an indicator variable for the shortage of health care professionals obtained from the Health Resources and Services Administration (HRSA).

[7]For these estimates, we do not include as a control average death rates related to opioids or cocaine in the 2000s.

markets or mortality. That said, the HDMP data do show a sharp geographic divide that is quite persistent over time—the correlation is 0.9 between black tar heroin shares in 1990 and 2016—though there are a few cities that flip from black tar to powder, such as St. Louis, which borders the river to the west. Also, it is not unusual that rivers or other geographic landmarks shape economic activity. And both DEA and CDC reports and newspaper articles often mention the river as a divider in fentanyl mortality.

We perform two empirical exercises, which suggest there is indeed a discountinuity near the Mississippi river. First, we estimate a distance gradient, by grouping counties by their distance from county centroid to the closest point of river. We find for both the 2013-2017 and 2018-2022 periods a jump in death rates within 50 miles of the Mississipi river. In our second approach, we take advantage of the fact that the Mississippi river famously runs north-south close to the 91st longitude west. We separately regress death rates on different east/west splits generated at different longitudes and collect each R-squared. For the 2013-2017 and 2018-2022 periods, we find that east/west splits generated near the Mississippi river (from 88th to 92nd longitude west) yield the highest R-squared. In contrast, the different east/west splits have no explanatory power during the 2000-2009 or 2010-2012 periods.

Given the empirical importance of proxying for heroin type, we next revisit the association between fentanyl mortality and job losses related to import competition and automation. This is a natural next step, as we show that eastern states have historically tended to be more manufacturing and import intensive. Also, a literature (since at least Case and Deaton (2017)) has attempted to quantify the potential economic roots of the opioid crisis. Pierce and Schott (2020) and Autor et al. (2019) argue that trade shocks from greater import competition with China led to higher opioids mortality. Charles et al. (2018) show that areas with larger declines in manufacturing employment shares in the 2000s and 2010s had higher opioids mortality in the mid-2010s. Moore et al. (2023) argue that fentanyl is partly imported through general trade patterns, and so more import intensive areas have all else equal experienced higher mortality from fentanyl.

We examine in the cross-section of U.S. counties and states how straightforward empirical associations change when including the east/west geographic indicator proxying for heroin type. As a direct indicator of relative job losses in manufacturing, we measure changes in the manufacturing employment share from both 1975-2000 and from 2000-2019 from the Quarterly Census of Employment and Wages (QCEW). These direct measures reflect secular trends in automation, trade, and potentially other sources. Second, we obtain average imports per resident from 2008-2020 from Moore et al. (2023), as a measure of variation across

states in import intensiveness.

We confirm that there is an association between average death rates in 2018-2022 with both historical changes in manufacturing employment shares and imports per resident.[8] However, the associated coefficient estimates are much smaller (and depending on specifications, not statistically significant) when including the east/west proxy for heroin type. This is the case despite significant variation in manufacturing declines and imports per resident within the east and west. Meanwhile, the coefficient estimate on the east/west indicator is little changed by the inclusion of historical declines in manufacturing or imports per resident. A full causal analysis of the association between job losses or trade exposure and opioids mortality is beyond the scope of this paper. Our goal here is to only highlight the importance of including an east-west geographic indicator proxying for historical differences in heroin type in studies of the causes of mortality.

In conclusion, this paper establishes that historical differences in heroin type mattered greatly for the speed and magnitude of the introduction of fentanyl across the country. In western states, the spread of fentanyl was slower, due to less mixing of fentanyl with black tar heroin. As fentanyl spread into non-opioids like cocaine and methamphetamine, the east-west gap in mortality has fallen in relative terms but remained high in level. We also show that accounting for historical differences in heroin type likely matters for studies of the underlying causes of mortality across U.S. areas.

References

Alpert, A., Evans, W. N., Lieber, E. M. J., and Powell, D. (2021). Origins of the Opioid Crisis and its Enduring Impacts*. *The Quarterly Journal of Economics*, 137(2):1139–1179.

Autor, D., Dorn, D., and Hanson, G. (2019). When work disappears: Manufacturing decline and the falling marriage market value of young men. *American Economic Review: Insights*, 1(2):161–78.

Bazazi, A., Low, P., and Gomez, B. e. a. (2024). Overdose from unintentional fentanyl use when intending to use a non-opioid substance: An analysis of medically attended opioid overdose events. *J Urban Health*, 101:245–251.

[8]That said, we find little association between opioids mortality *in the 2000s* with both manufacturing declines from 1975 to 2000 and 2000 to 2019. It is unclear why the mortality effects of manufacturing declines would be so lagged or skip over the 2000s prescription opioids crisis.

Case, A. and Deaton, A. (2017). Mortality and Morbidity in the 21st Century. *Brookings Papers on Economic Activity*, 48(1 (Spring):397–476.

Charles, K. K., Hurst, E., and Schwartz, M. (2018). The Transformation of Manufacturing and the Decline in U.S. Employment. Working Papers 2018-028, Human Capital and Economic Opportunity Working Group.

Cho, D., Garcia, D. I., Montes, J., and Weingarden, A. E. (2021). Labor Market Effects of the Oxycodone-Heroin Epidemic. Finance and Economics Discussion Series 2021-025, Board of Governors of the Federal Reserve System (U.S.).

Ciccarone, D. (2009). Heroin in brown, black and white: structural factors and medical consequences in the us heroin market. *Int J Drug Policy*, 20(3):277–82.

Ciccarone, D. and Bourgois, P. (2003). Explaining the geographical variation of hiv among injection drug users in the united states. *Subst Use Misuse.*, 38(14):2049–63.

Currie, J. and Schwandt, H. (2020). The Opioid Epidemic Was Not Caused by Economic Distress But by Factors that Could be More Rapidly Addressed. NBER Working Papers 27544, National Bureau of Economic Research, Inc.

Maclean, J. C., Mallatt, J., Ruhm, C. J., and Simon, K. I. (2022). The Opioid Crisis, Health, Healthcare, and Crime: A Review Of Quasi-Experimental Economic Studies. NBER Working Papers 29983, National Bureau of Economic Research, Inc.

Miller, J. N. (2020). The War On Drugs 2.0: Darknet Fentanyl'S Rise And The Effects Of Regulatory And Law Enforcement Action. *Contemporary Economic Policy*, 38(2):246–257.

Moore, T. J., Olney, W. W., and Hansen, B. (2023). Importing the Opioid Crisis? International Trade and Fentanyl Overdoses. NBER Working Papers 31885, National Bureau of Economic Research, Inc.

Pardo, B., Jirka, T., Jonathan P., C., Beau, K., Peter, R., and Bradley, D. S. (2019). *The Future of Fentanyl and Other Synthetic Opioids*. RAND Corporation.

Pierce, J. R. and Schott, P. K. (2020). Trade liberalization and mortality: evidence from us counties. *American Economic Review: Insights*, 2(1):47–64.