

Introduction

Public health context: Drug overdose deaths remain a major U.S. crisis, with rising involvement of synthetic opioids (e.g., fentanyl) and stimulants^{1,2}

Evolving epidemic: Shift from prescription opioid-driven overdoses to illicit drug use and polysubstance involvement^{3,2,4}

Data insight: Statewide reporting may obscure regional variation, while county-level analyses provide more actionable data for targeted interventions⁵

Tennessee trends & implications: Increasing fentanyl- and stimulant-related deaths with declining prescription opioid mortality highlight the need for early identification and community-based, prevention-focused care actionable insights for targeted public health interventions and resource allocation

Recent surveillance data from Tennessee demonstrate substantial increases in fentanyl- and stimulant-involved overdose deaths alongside declining prescription opioid-related mortality, suggesting a transition in the drivers of overdose outcomes. *From an osteopathic perspective, early identification of these patterns supports prevention-focused, community-based care*

Hypothesis

We hypothesized that overdose mortality trends in Tennessee have shifted from a predominantly prescription opioid-associated pattern to an illicit, fentanyl-dominant crisis with increasing involvement of stimulant co-exposure.

We further hypothesized that:

- Overdose deaths involving both opioids and stimulants would increase over time, reflecting a growing polysubstance overdose burden
- Prescription opioid dispensing rates would not demonstrate a strong positive association with overdose mortality.

Methods

Data source: County-level data from all 95 Tennessee counties (2018–2023) compiled into a structured, de-identified dataset⁷

Data processing: Variables were aggregated annually at the county level across all measures

Statistical analysis: Included trend and percent change analysis, Pearson correlation, rural-urban stratification, and multiple linear regression modeling

Evaluation & compliance: Results analyzed at both statewide and county levels; study used publicly available data.

Experimental Design

- County-level data from all 95 Tennessee counties (2018-2023) were compiled into a structured dataset

- Data were aggregated at the annual county level across all variables

The dataset was analyzed in three stages:

- Trend analysis** to evaluate changes in overdose outcomes over time
- Association analysis** to examine relationships between prescription rates, nonfatal indicators, and overdose mortality
- Multivariable modeling** to assess adjusted relationships between predictors and overdose outcomes

- Results were evaluated at both the statewide and county level, with additional rural-urban stratification to assess regional patterns

Results

- Statewide overdose deaths increased from 1,818 to 3,616 between 2018 and 2023 (~99%)⁷
- Fentanyl-involved and stimulant-involved deaths increased substantially (>260% and >220%, respectively)
- Opioid + stimulant-involved deaths showed the largest increase (~315%), supporting a shift toward polysubstance overdose dynamics.
- Prescription opioid-involved and heroin-related deaths decreased (~23% and >90%, respectively)
- County-level patterns were consistent, with widespread increases in fentanyl- and polysubstance-involved deaths
- Prescription opioid rates showed negative associations with overdose mortality
- Nonfatal overdoses and prior-year mortality were significant predictors of overdose deaths in regression models

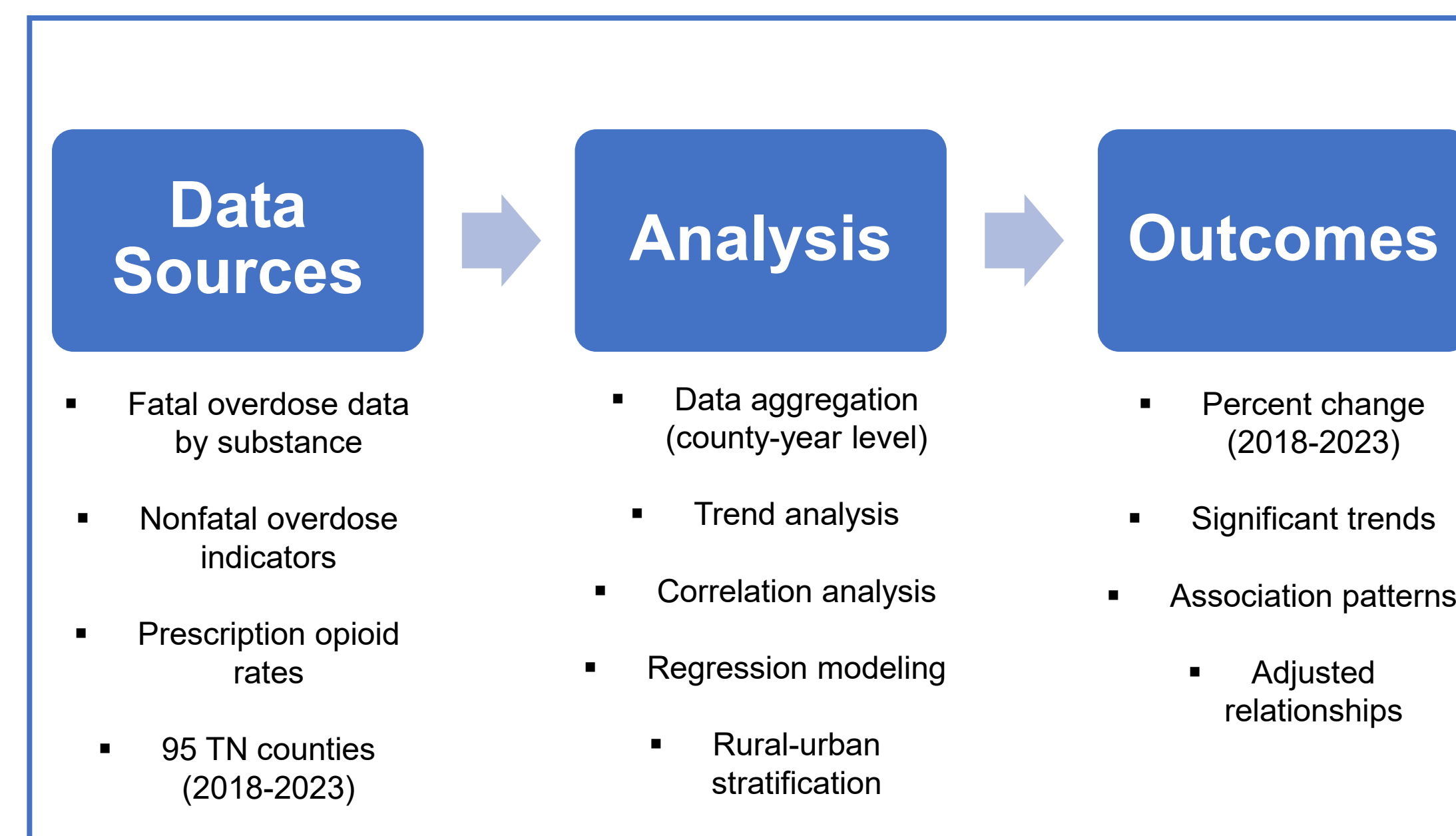
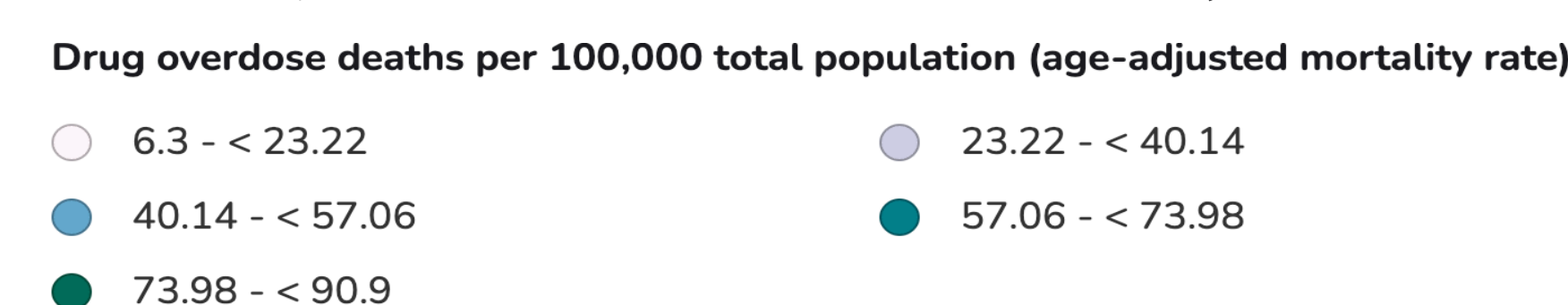
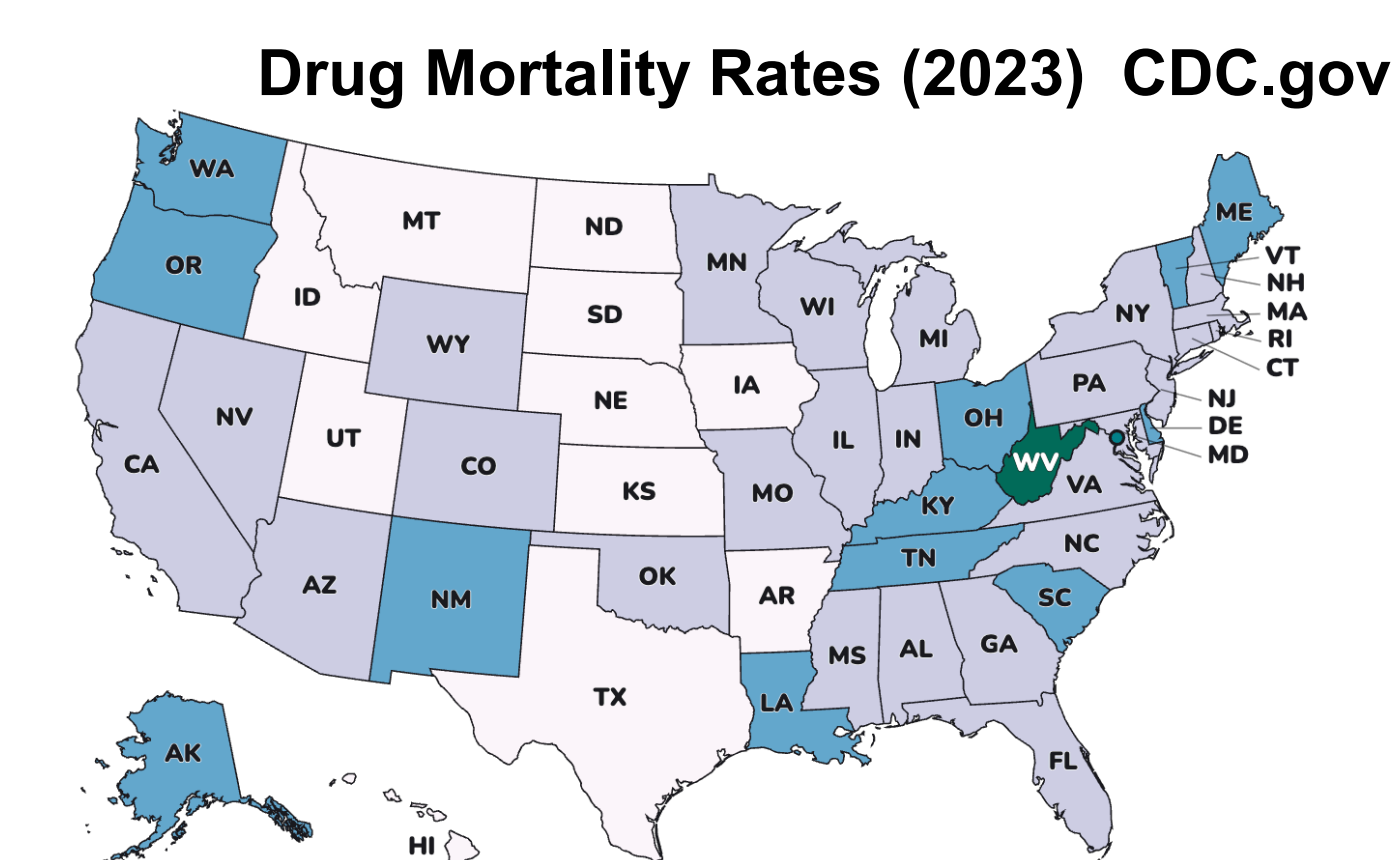


Figure 1. Study design overview illustrating data sources, analytical workflow, and outcome measures used in county-level overdose analysis across Tennessee (2018-2023)

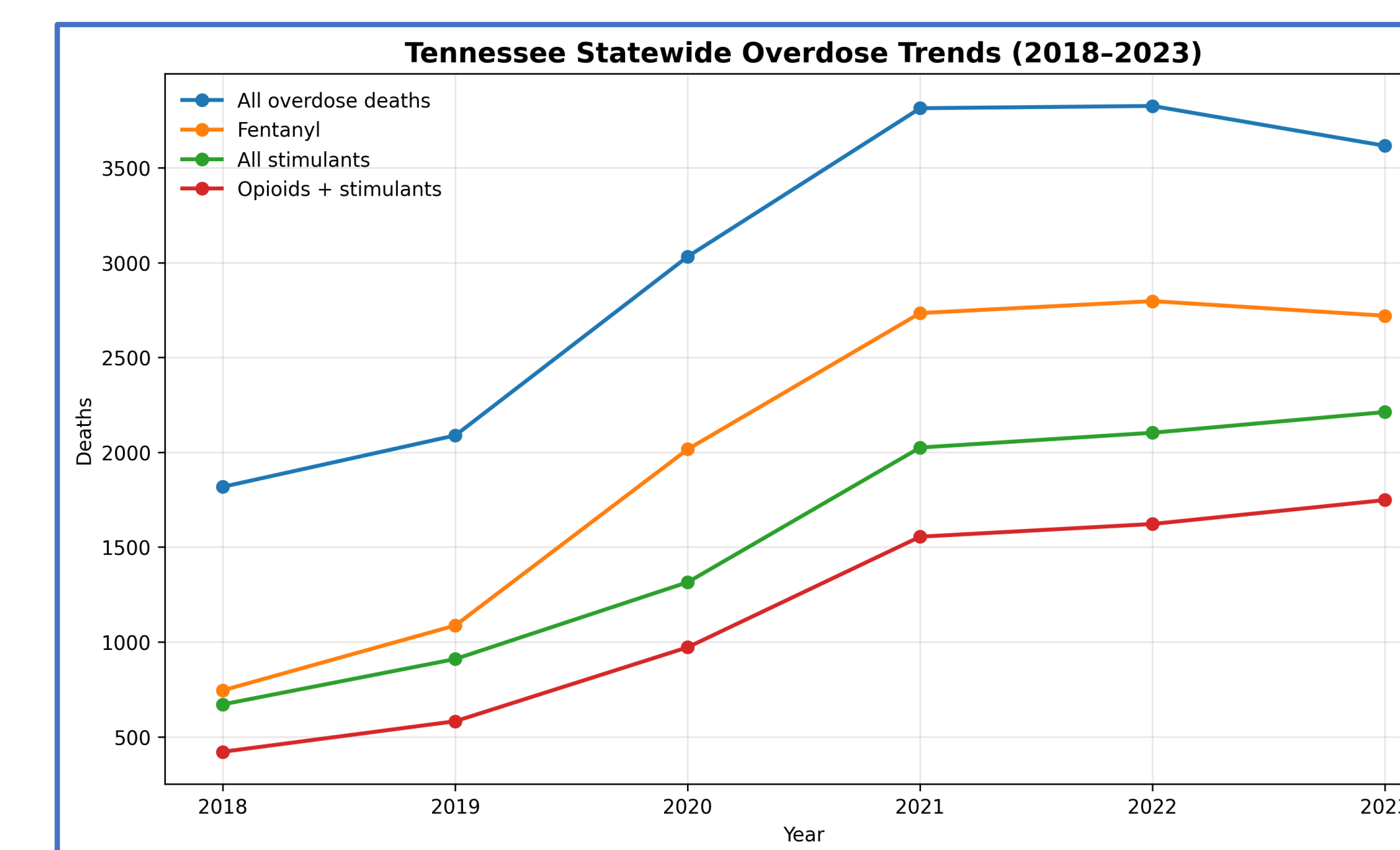


Figure 2. Statewide overdose deaths in Tennessee increased substantially from 2018 to 2023, driven primarily by fentanyl and stimulant involvement. Opioid and stimulant co-involved deaths also increased, supporting a shift toward polysubstance overdose dynamics.

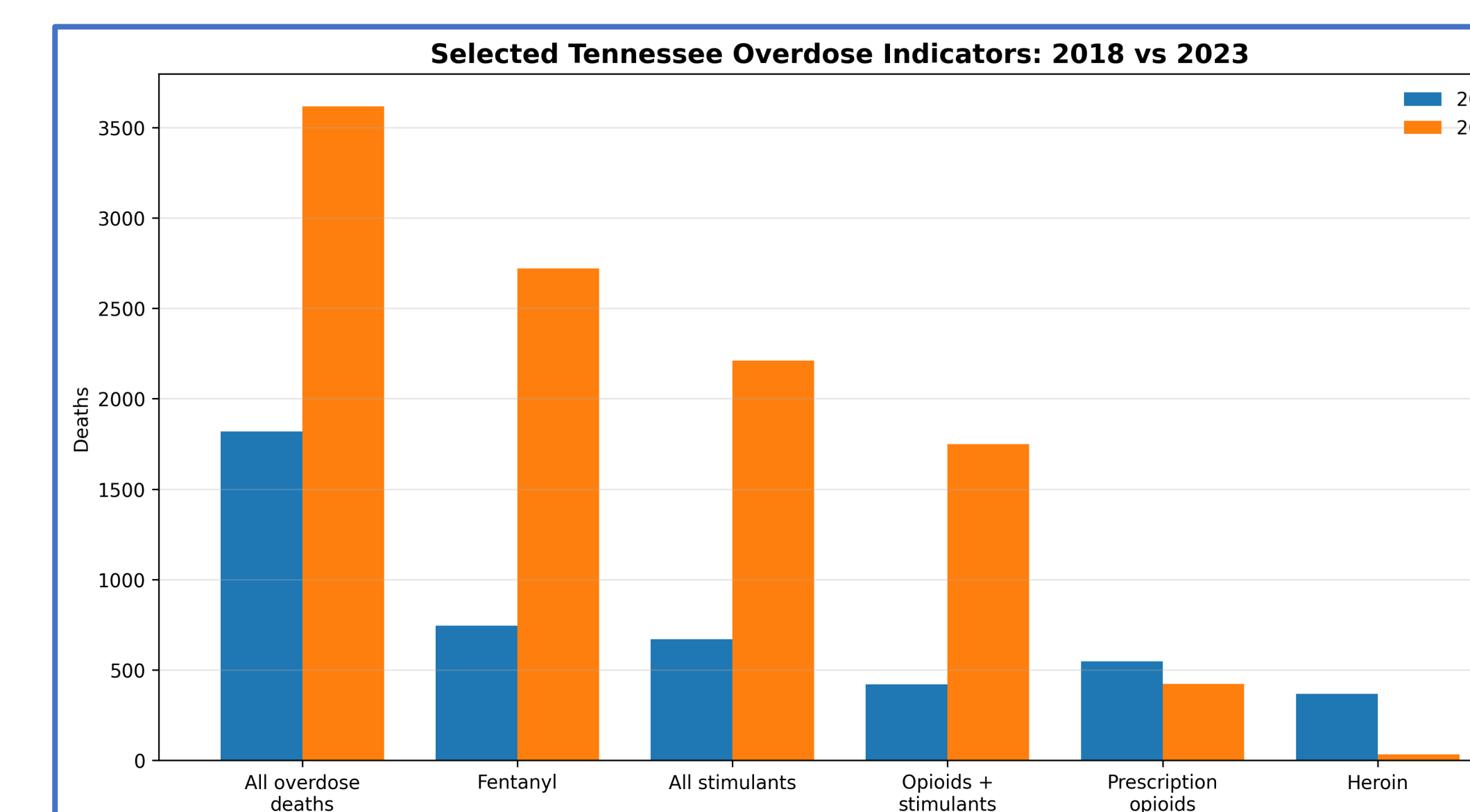


Figure 3. Comparison of selected overdose indicators between 2018 and 2023. Fentanyl- and opioid + stimulant-involved deaths increased markedly, while prescription opioid-related and heroin-related deaths decreased.

Data

- County-level data from all 95 Tennessee counties (2018-2023) were analyzed
- Data included fatal overdose deaths, nonfatal indicators, and prescription dispensing rates.
- All data were publicly available, de-identified, and aggregated at the annual county level.

Limitations

- Analysis was limited to publicly available, county-level data, which may be affected by reporting variability and delays⁶
- Because data were analyzed at the county level, results may not reflect individual-level risk factors or causes of overdose
- Substance involvement may be underreported or misclassified, particularly for emerging or polysubstance overdoses
- County-level aggregation may obscure within-county variation and local hotspots of overdose activity

Conclusion

- Overdose mortality in Tennessee increased substantially from 2018–2023, driven primarily by fentanyl and stimulant involvement
- Findings demonstrate a shift from a prescription opioid-driven epidemic to a predominantly illicit, polysubstance overdose crisis
- The lack of strong association between prescription opioid rates and overdose mortality highlights the growing role of illicit drug markets
- County-level trend analysis may help identify high-risk regions earlier and support more targeted public health interventions
- These findings emphasize the need for prevention strategies focused on illicit substance use and polysubstance overdose risk

References

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