

EXHIBIT B

Risk factors associated with kratom deaths in a single state

Christian Iuteri MD, Ryan Sawyers MD, Connor Byrne MD, Max Trojano MD, & Josef Thundiyil MD

Department of Emergency Medicine, Orlando Health



Background

- **Mitragynine (MTG)** is the primary active compound in kratom, a widely available but unregulated herbal supplement in the U.S.
- MTG is described to have stimulant effects at low doses with opioid-like effects at higher concentrations
- MTG was labeled as a Schedule I drug by the DEA in 2016. After significant backlash, this decision was revoked in October 2016.
- Advocates site analgesia, mood enhancement, and role as an opioid alternative. However, therapeutic effects of the drug are largely anecdotal with few if any clinical trials
- Kratom has been increasingly implicated in overdose deaths, yet limited data exist on specific risk factors associated with kratom-attributable mortality.
- The mechanisms underlying MTG induced fatalities (MIFs) remain poorly understood, complicating public health and forensic responses.

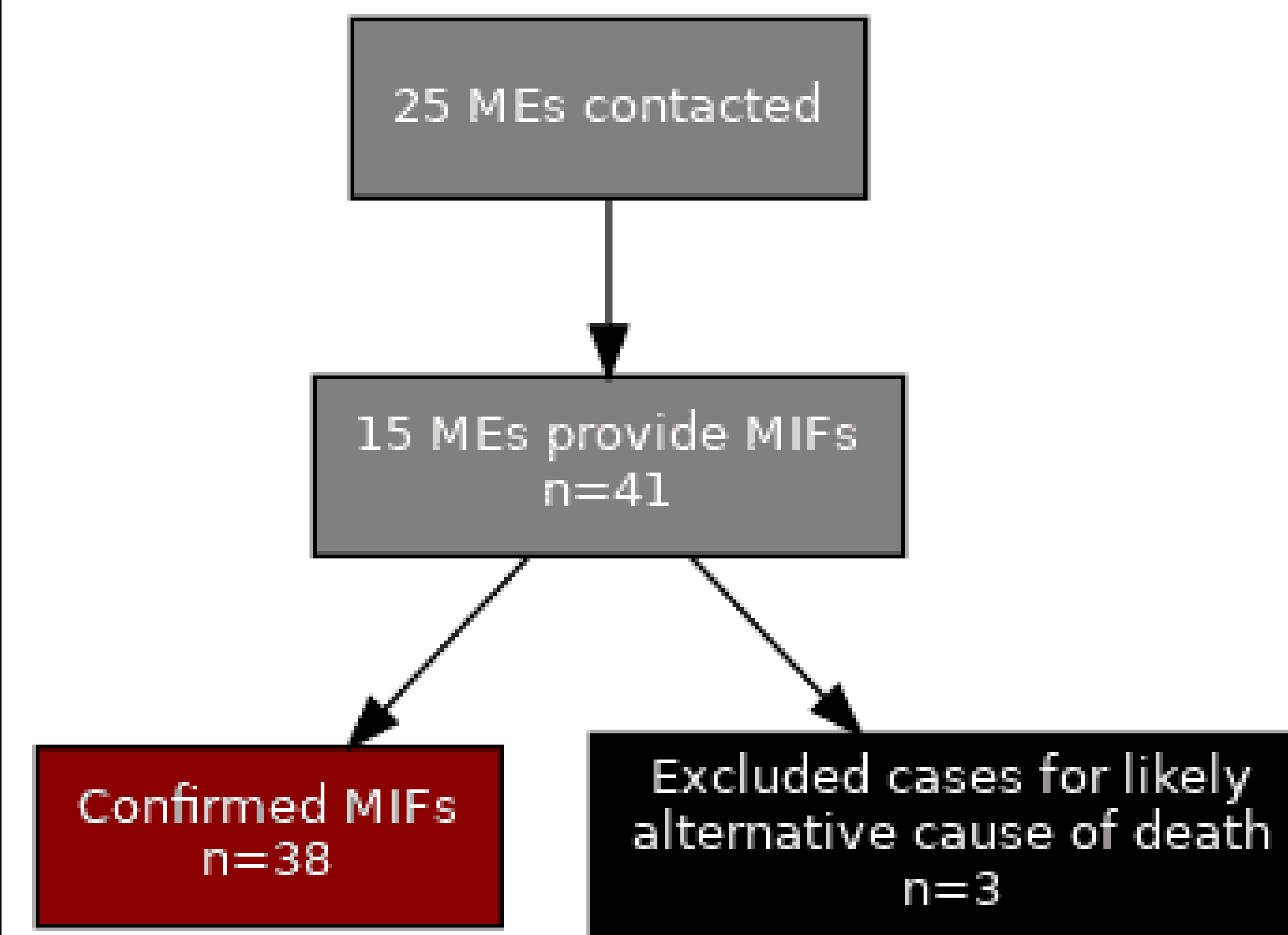
Objective

This study aims to investigate trends among Florida decedents with confirmed MIFs to improve understanding of perimortem risk factors.

Disclosures

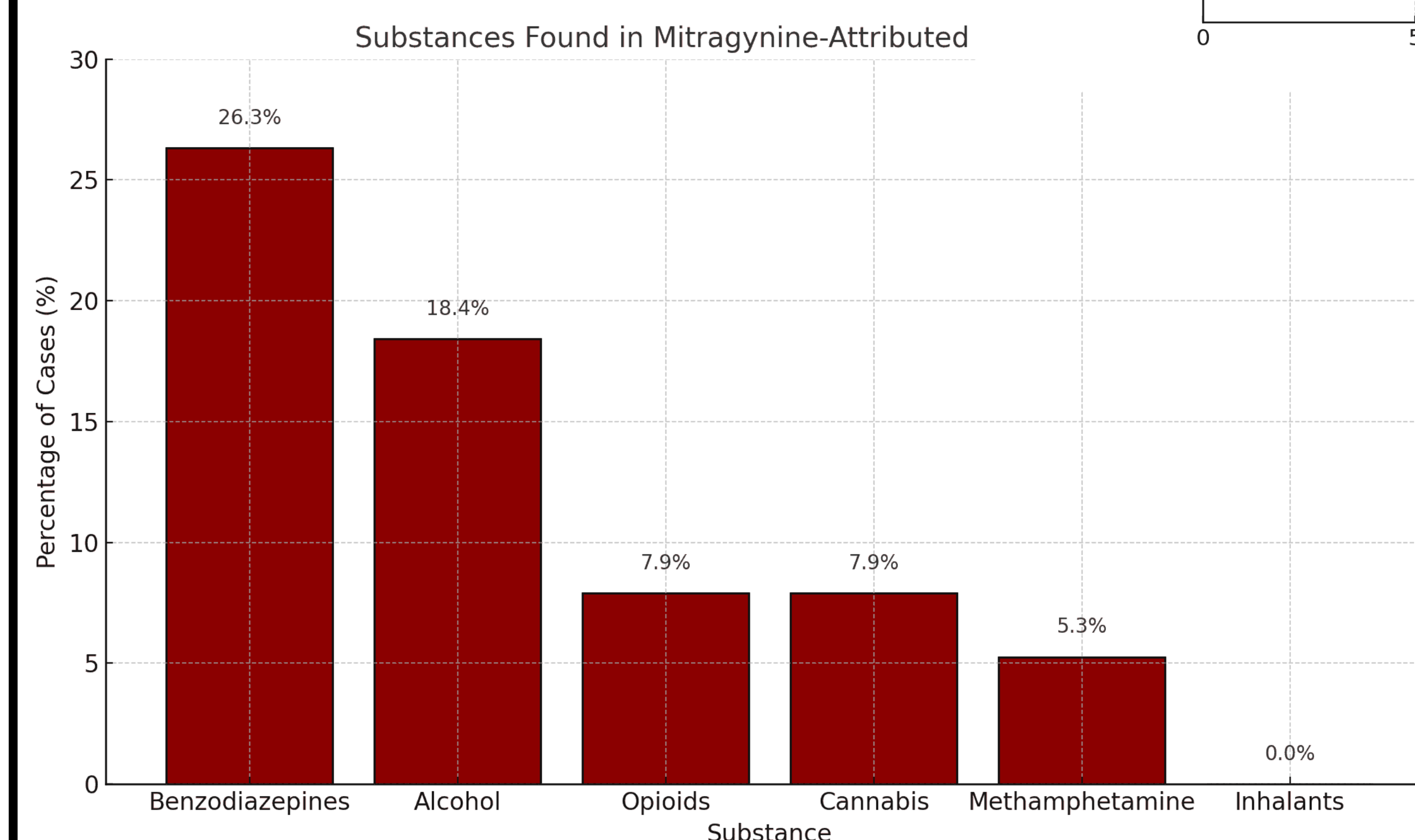
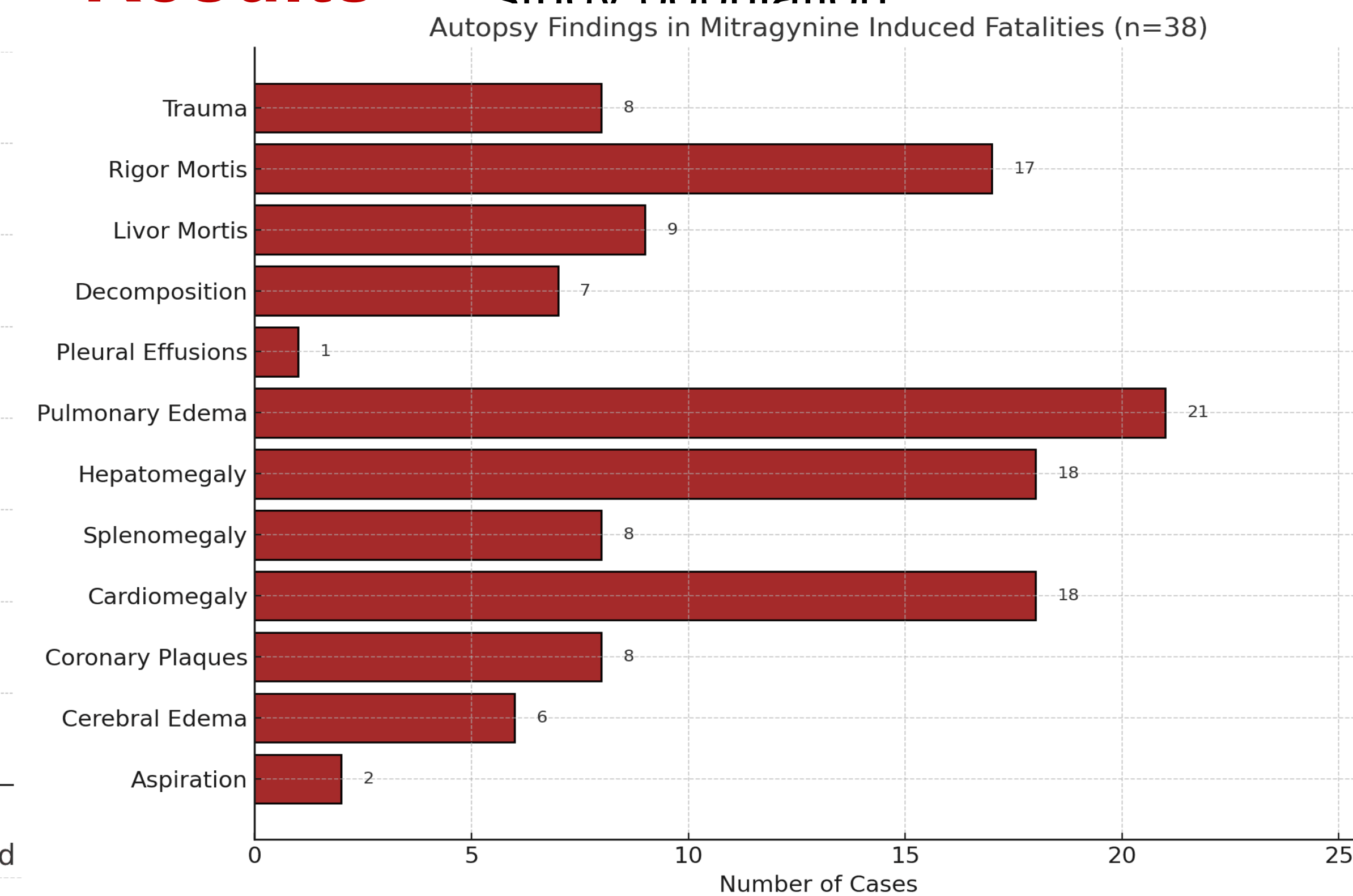
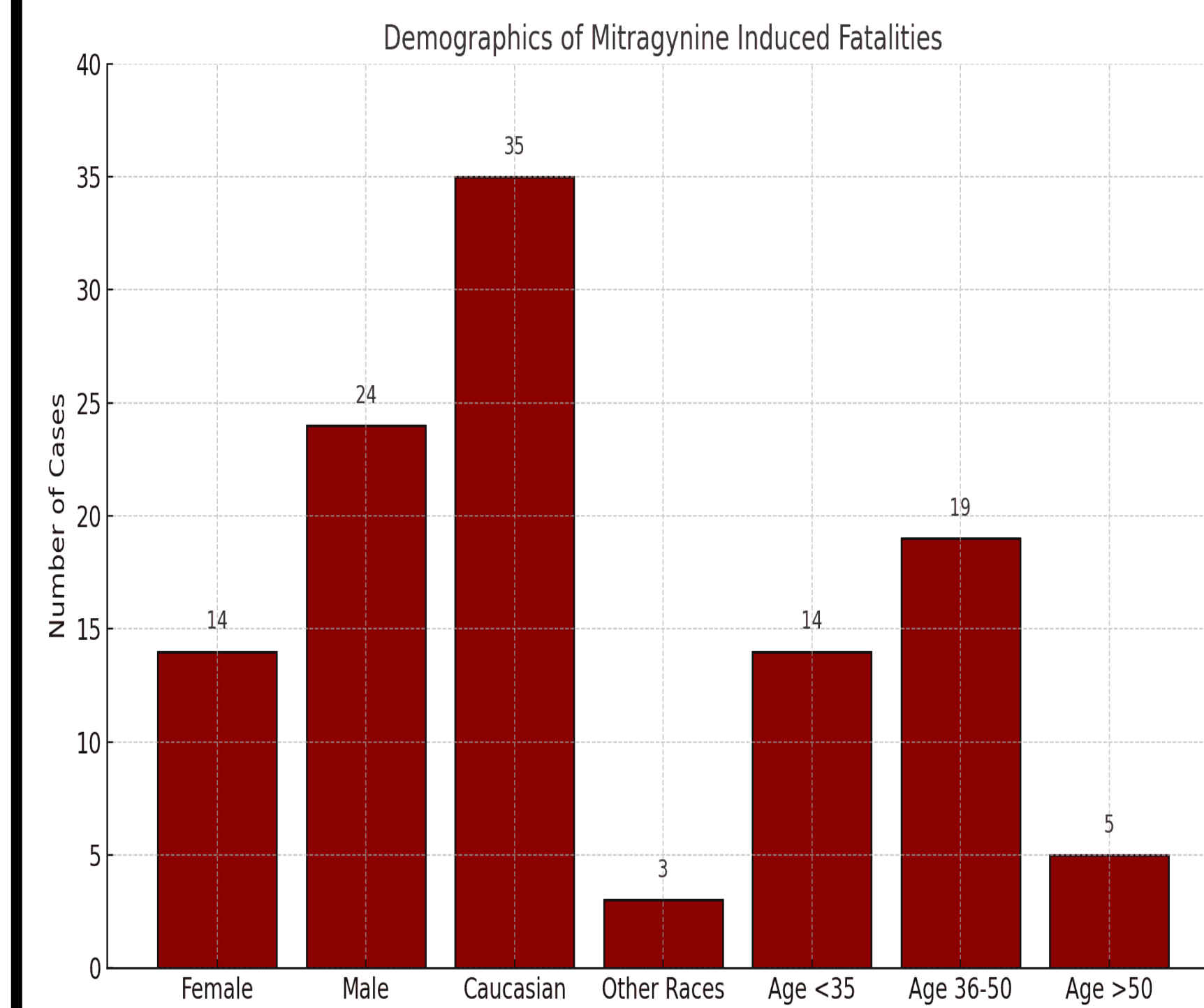
The authors have no disclosures

Methods



- Requested autopsy reports from all Florida medical examiner (ME) offices from a 5-year period involving suspected mitragynine induced fatalities (MIF)
- Included cases where mitragynine was the most likely cause of death; excluded cases with more probable alternative causes.
- Used a standardized data extraction tool to record demographics, toxicology, medical history, autopsy findings, and perimortem circumstances.
- Four trained reviewers independently extracted and verified data to ensure consistency and accuracy.
- Applied descriptive statistical analysis to identify trends and calculate mean mitragynine concentrations in the study population

Results



- Majority of patients were Caucasian males between 36 and 50
- 80% of cases featured polysubstance
- Mean mitragynine level 2486.89 with standard deviation of 1981.64
- 55% of cases featured pulmonary edema on autopsy

Conclusions

Key Takeaways

- Mitragynine is a potential drug of abuse. Cause of death is likely multifactorial. Toxic levels remain unclear, but majority of deaths occur with levels >2000
- **Demographic trends** suggest individuals most at risk are predominantly **male, white, and in their late 30s.**
- **Polysubstance use was common**, with 80% of decedents testing positive for additional substances, primarily prescription medications
- Further investigation is needed to define a clear **toxicologic threshold** and to better understand potential **drug interactions or comorbidities** in MIFs

References

- Hill K, Rogers JM, Grundmann O, Epstein DH, Smith KE. At least four groups of kratom consumers in the United States: latent-class analysis of motivations for kratom use. *Am J Drug Alcohol Abuse*. 2025 Jan 30;1-13. doi: 10.1080/00952990.2024.2414319. Epub ahead of print. PMID: 39883932.
- Anwar M, Law R, Schier J. Notes from the Field. Kratom (Mitragyna speciosa) Exposures Reported to Poison Centers — United States, 2010–2015. *MMWR Morb Mortal Wkly Rep* 2016;65:748–749. DOI: <http://dx.doi.org/10.15585/mmwr.mm6529a4>
- Post S, Spiller HA, Chounthirath T, Smith GA. Kratom exposures reported to United States poison control centers: 2011–2017. *Clin Toxicol (Phila)*. 2019 Oct;57(10):847–854. doi: 10.1080/15563650.2019.1569236. Epub 2019 Feb 20. PMID: 30786220.
- DeJonge P, Gummin D, Tittebaum N, Meiman J. Description of Kratom Exposure Events in Wisconsin as Reported to the Wisconsin Poison Center, January 1, 2010 to September 1, 2022. *WMJ*. 2023 Jul;122(3):187–190. PMID: 37494649; PMCID: PMC10403292
- Gianulisos G. The DEA Changes Its Mind on Kratom. *U.S. Pharmacist*. 2017 June;41(3):7-9. <https://www.uspharmacist.com/article/the-dea-changes-its-mind-on-kratom>
- Singh D, Yeou Chear NJ, Narayanan S, Leon F, Sharma A, McCurdy CR, Avery BA, Balasingam V. Patterns and reasons for kratom (Mitragyna speciosa) use among current and former opioid poly-drug users. *J Ethnopharmacol*. 2020 Mar 1;249:112462. doi: 10.1016/j.jep.2019.112462. Epub 2019 Dec 7. PMID: 31816368.
- Li X, Ndungu P, Taneja SB, Chapin MR, Egbert SB, Akenapalli K, Paine MF, Kane-Gill SL, Boyce RD. An evaluation of adverse drug reactions and outcomes attributed to kratom in the US Food and Drug Administration Adverse Event Reporting System from January 2004 through September 2021. *Clin Transl Sci*. 2023 Jun;16(6):1002-1011. doi: 10.1111/cts.13505. Epub 2023 Mar 20. PMID: 36861661; PMCID: PMC10264943.
- Torrico T, Patel K, Nikolov N, Salam MT, Padhy R, Weinstein D. Presence of kratom in opioid overdose deaths: findings from coroner postmortem toxicological report. *Front Psychiatry*. 2024 Jan 10;14:1332999. doi: 10.3389/fpsy.2023.1332999. PMID: 38268564; PMCID: PMC10806006.