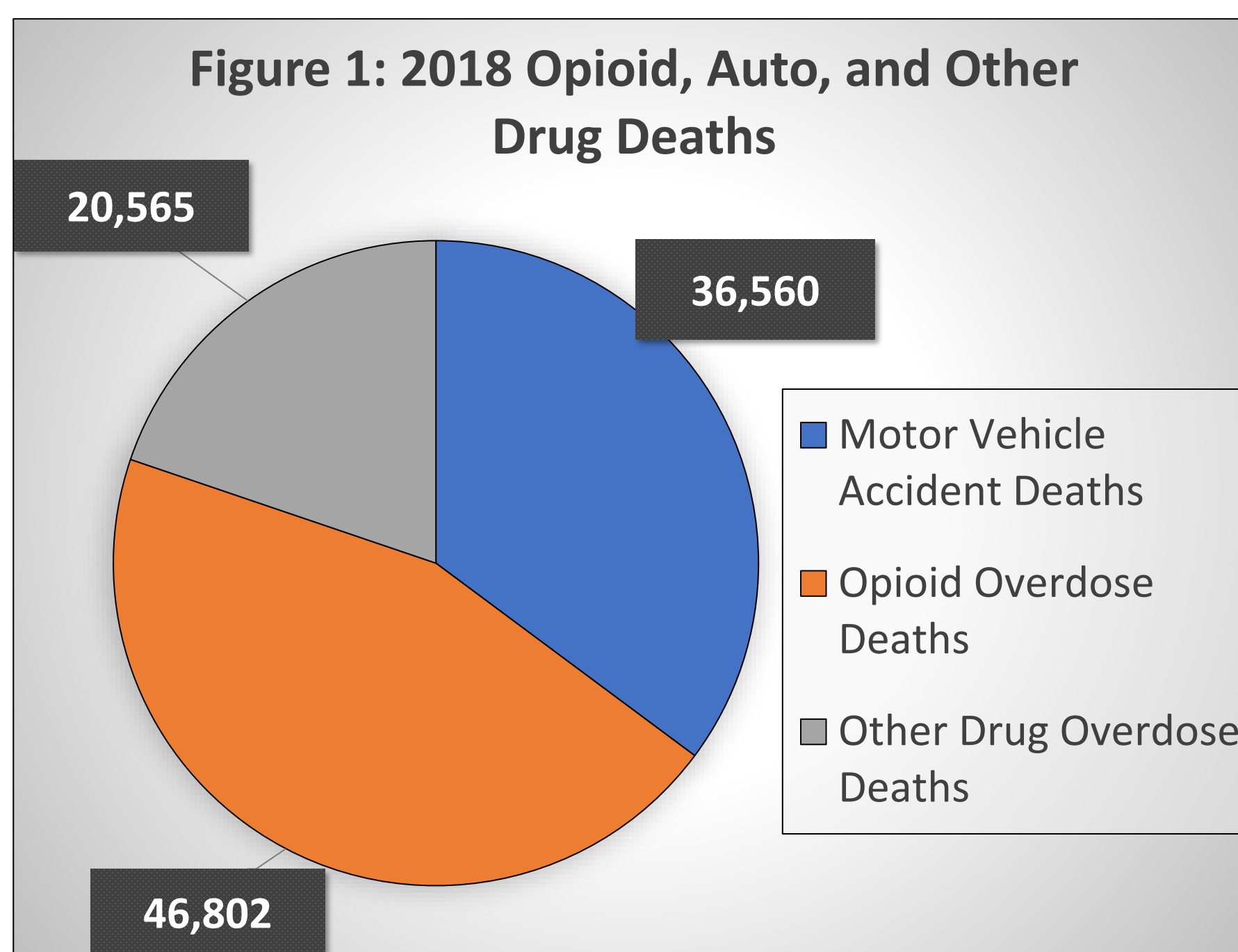


Effects of Adjuncts on Opioids

Introduction

Opioids are commonly used as pain relievers but can be very harmful to the people taking them. Studies have shown that opioids cause more deaths than car wrecks or all other drug overdoses combined as displayed in figure 1. Certain non-opioid drugs (Adjuncts) can be used to lower the amounts of opioids taken, and to limit addiction while maintaining effectiveness. To study which adjuncts lower the severity and which ones don't, we have analyzed over 135 million records from the FDA's Adverse Event Reporting System (FAERS) dataset. The outcomes varied, but some of the cases were extreme. An adjunct could make the effects of one opioid less severe and make another opioid's effects more severe. For example, the addition of Acetaminophen to Fentanyl lowered the reported death percentage by 28.38%, while the addition of Acetaminophen to Hydrocodone made the death rate 35.79% higher.



Research Questions

- Does the addition of adjuncts to opioid prescriptions significantly impact adverse drug events?
- Which adjunct and opioid combinations are most dangerous?

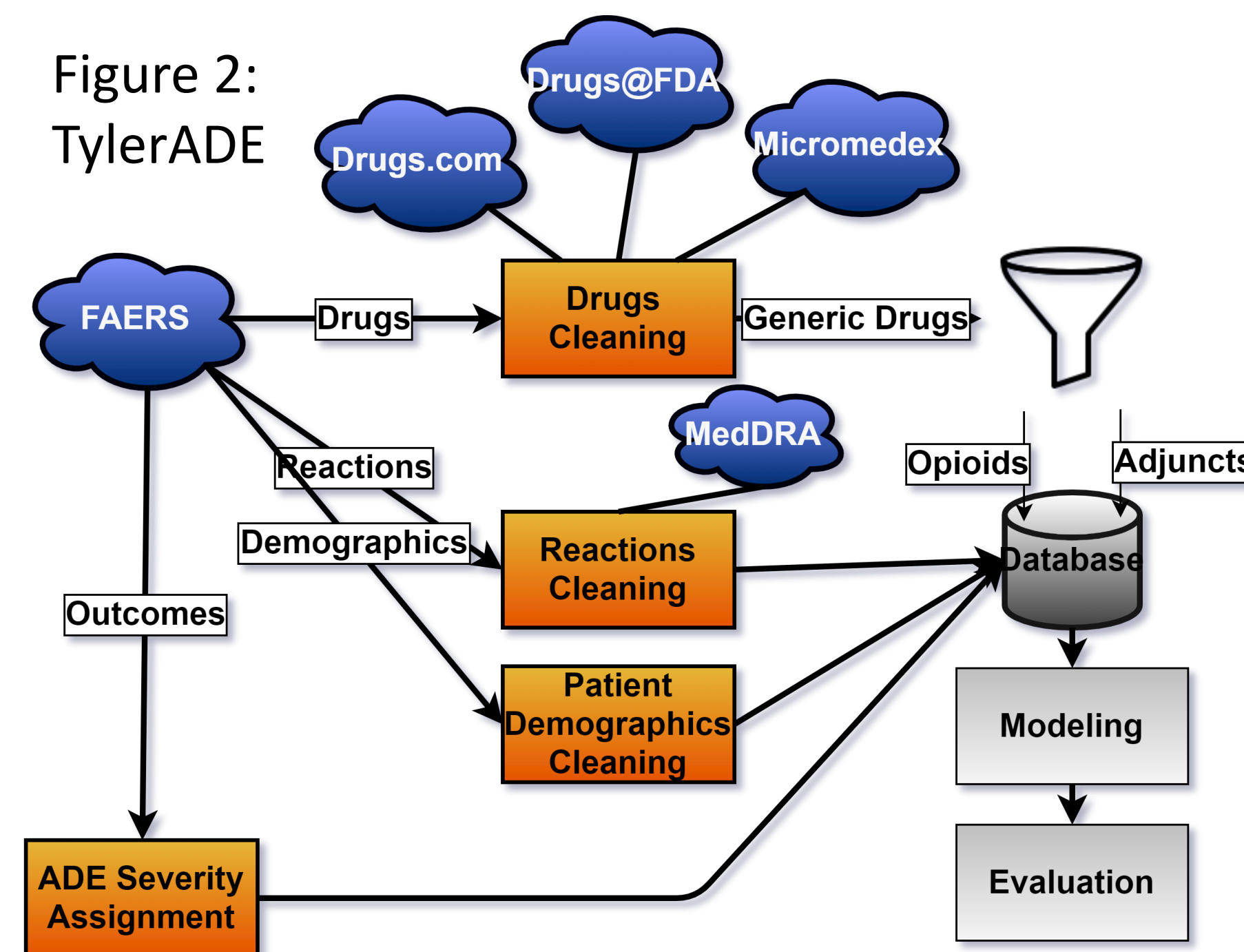
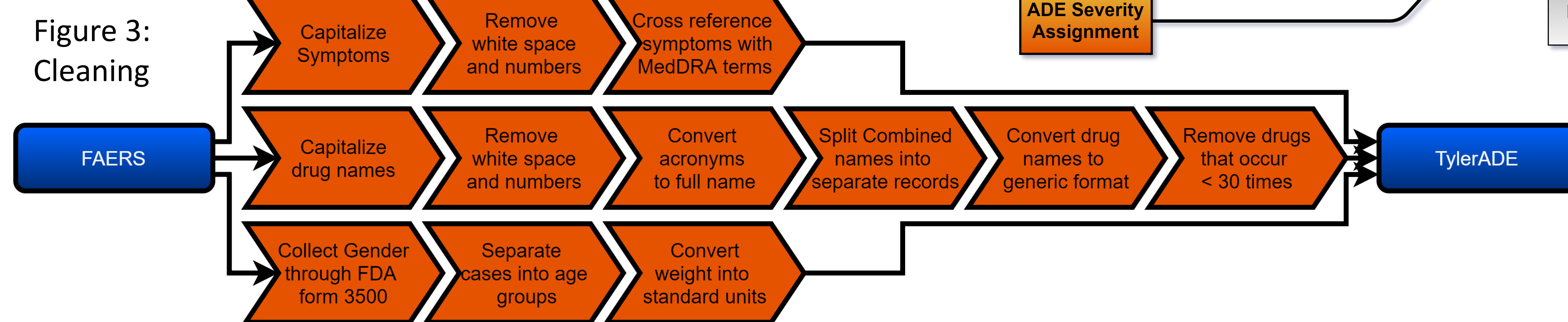
System Design

We used data from the FAERS database to populate our TylerADE system shown in figure 2. We used the methods shown in figure 3 to clean and prepare the data. We captured patient outcomes from FDA form 3500 shown in figure 4. Our severity is calculated by averaging outcomes. Death has a severity rating of 7, life-threatening has a rating of 6, hospitalization has a rating of 5, and so on.

Figure 4: FDA form 3500

2. Outcome Attributed to Adverse Event (Check all that apply)

<input type="checkbox"/> Death Include date (dd-mmm-yyyy):	<input type="checkbox"/> Disability or Permanent Damage
<input type="checkbox"/> Life-threatening	<input type="checkbox"/> Congenital Anomaly/Birth Defects
<input type="checkbox"/> Hospitalization – initial or prolonged	<input type="checkbox"/> Other Serious (Important Medical Events)
<input type="checkbox"/> Required Intervention to Prevent Permanent Impairment/Damage (Devices)	



Experimental Design

Our FAERS data was from 2004 Quarter 1 to 2018 Quarter 2 as displayed in Figure 5. We build three models to analyze our data. Each model was a matrix of Drug Names, Patient Deaths, ADR's, and Demographics. The first model contained 75 adjuncts, the second model contained 20 opioids, and the final model contained both opioids and adjuncts as shown in figure 6.

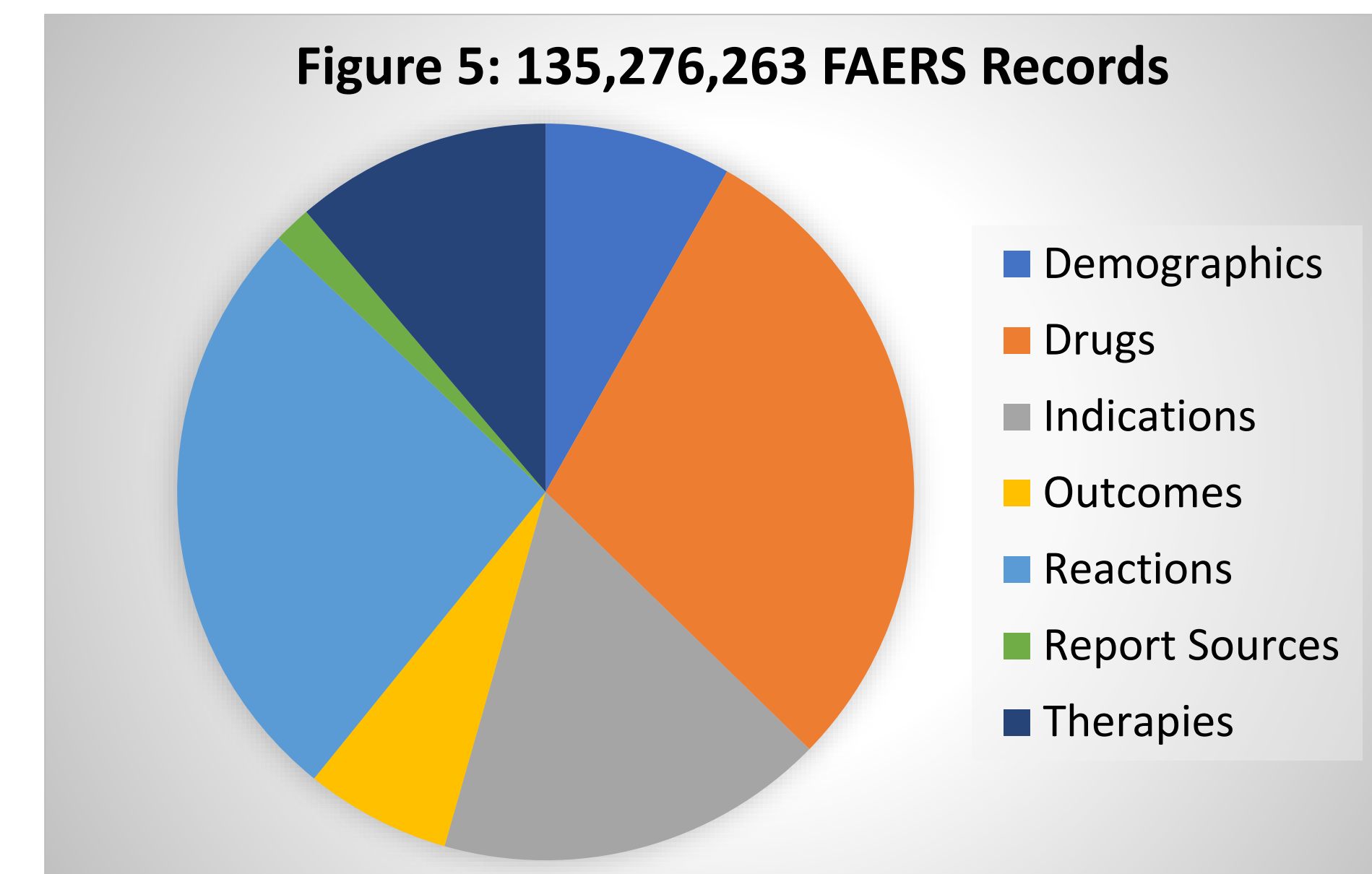
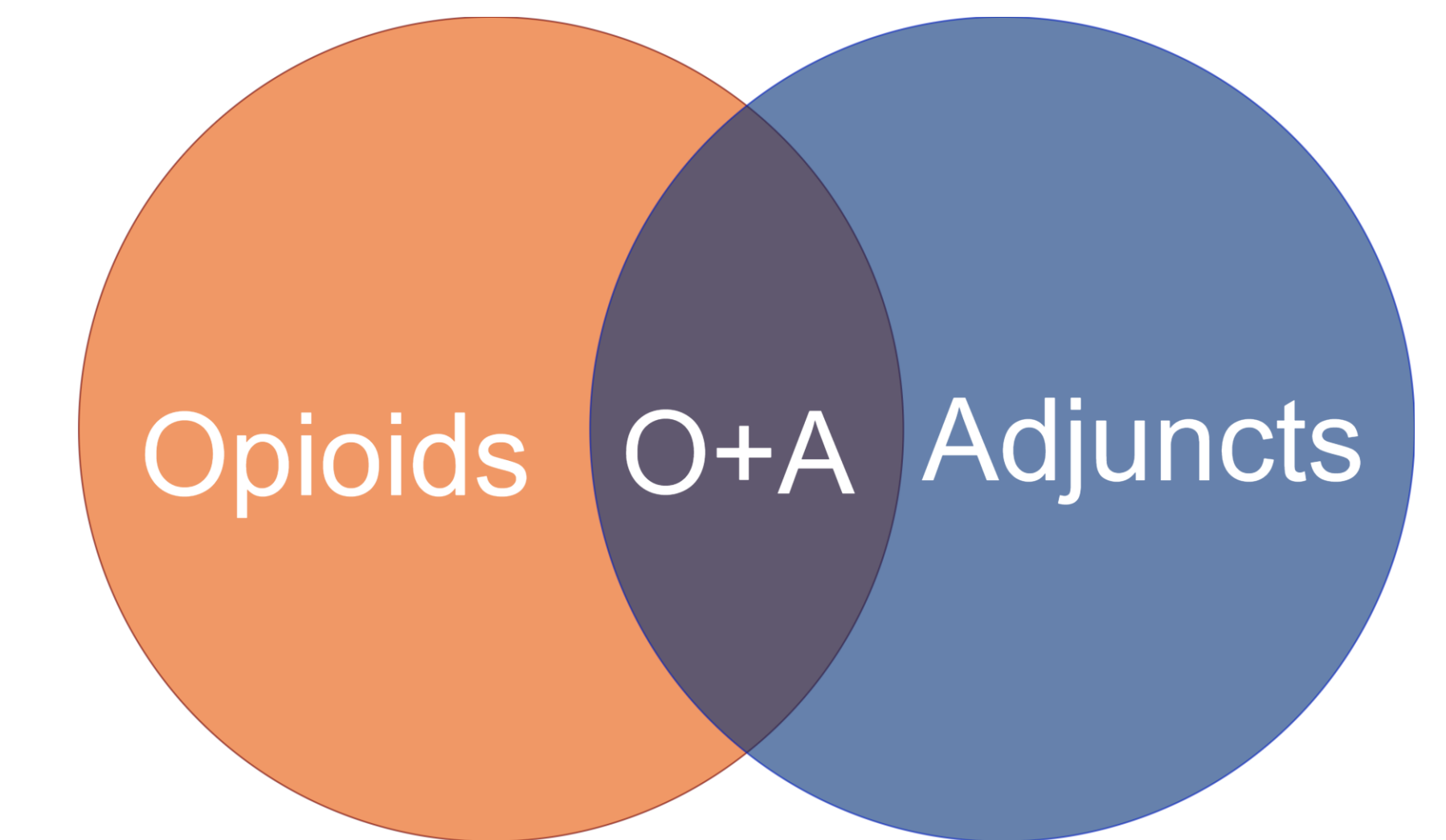


Figure 6: Models



Experimental Results and Discussion

We found that on average that the addition of a random adjunct to a random opioid showed no benefit. However, after looking at specific drug combinations, some of them showed a major increase in severity, and others showed a major decrease in severity. We made a list of the most dangerous combinations in figure 7. Figure 8 shows the combinations that showed the greatest impact at lowering severity.

Figure 7: Dangerous Combinations

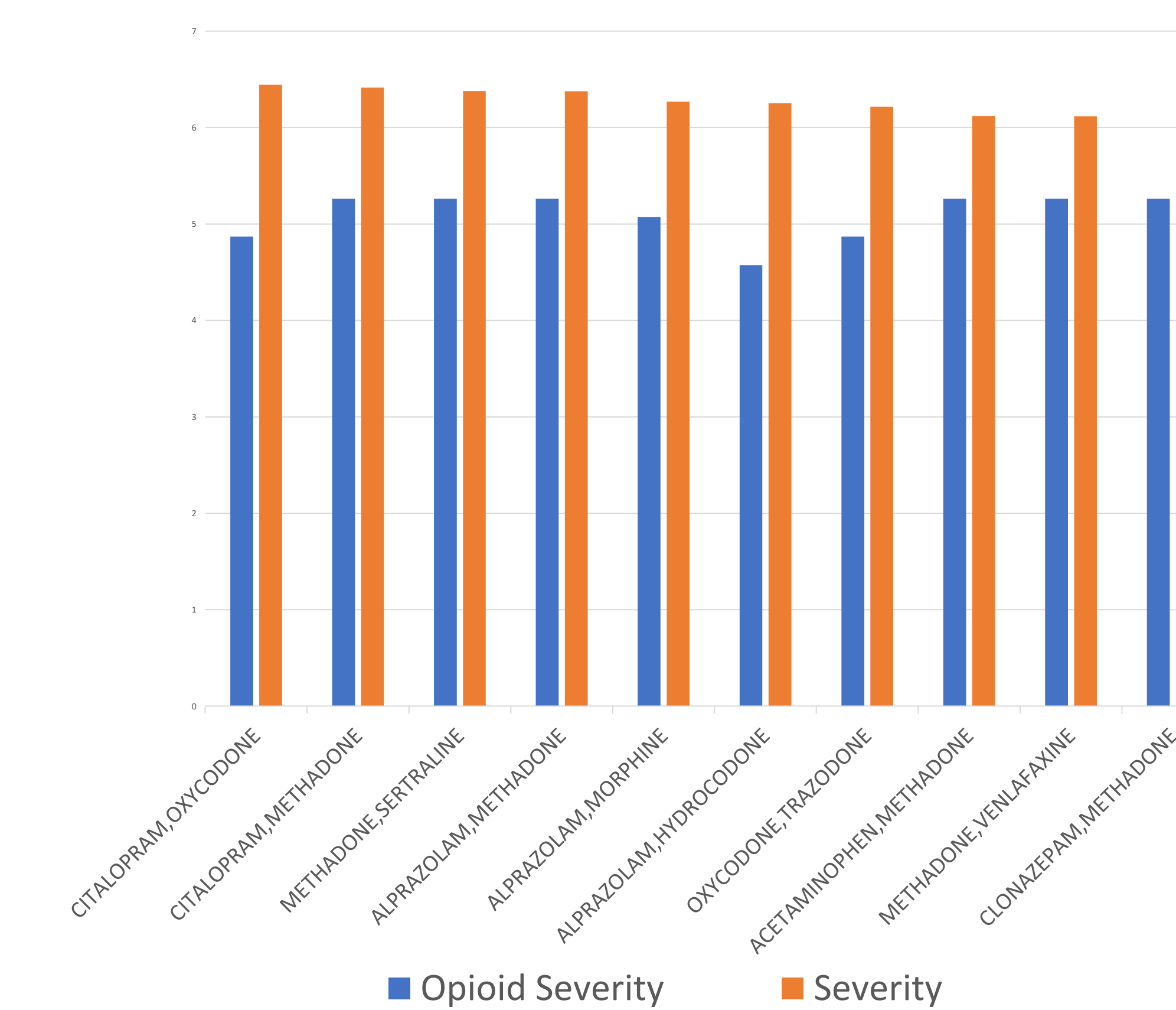
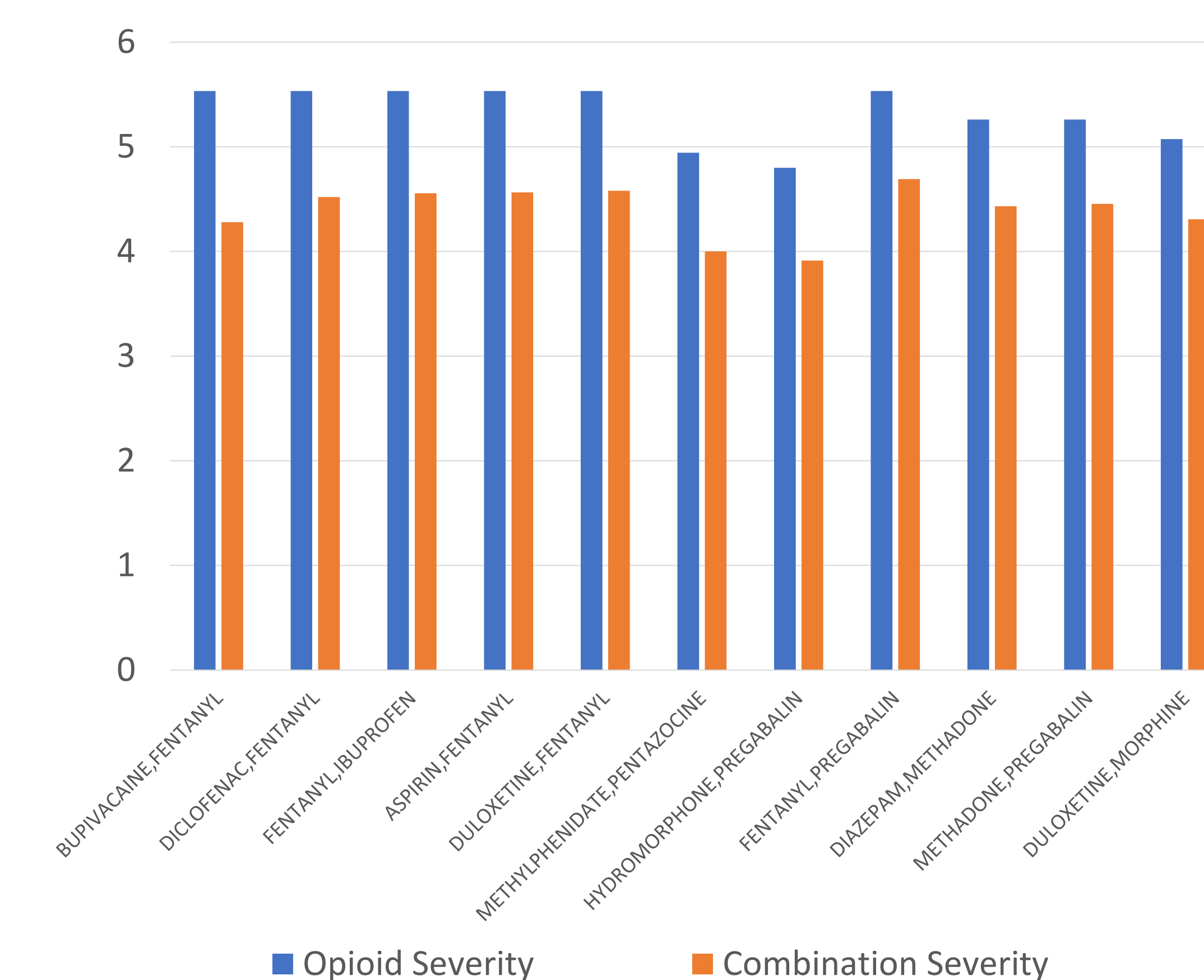


Figure 8: Combinations that Lowered Severity



Conclusions

Certain adjuncts significantly lower the severity of the opioids they are taken with, while other combinations could be deadly.

Acknowledgements

Thank you to Dr. Schumaker, Director of Data Analytics Laboratory and Dr. Michael A. Veronin, Department of Pharmaceutical Sciences for helping me with the research for this poster.

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