SCHOOL OF INFORMATICS AND COMPUTING
INDIANA UNIVERSITY
IUPUI

Impact of Medication Use on Pregnancy Outcomes

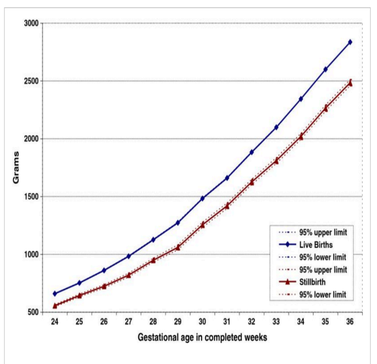
Ashritha Dandam, Josette Jones PhD. RN, Dr. Sara Kay Quinney, PhD

Abstract

- The use of medications among pregnancy women is increased from 2010 to 2017.
- Most of the clinical trials studies are less focused on determining the effect of medications on pregnant women rather inclined towards the general population.
- The data used for this analysis is from the NumMom2B study, a prospective cross-sectional study of 10,000 nulliparous women.
- Machine learning models like logistic, Multinomial Regression and random forest were performed to predict the outcomes
- We found that the number of drugs taken by women do not impact on the pregnancy outcomes.
- Specific classes of drugs, including anti-pyretic, anti-epileptic, anti-depressants were correlated with adverse pregnancy outcomes.

Background

- As per the research, one in ten born babies are affected with preterm birth which is one of the major concerns for the physicians and it accounts for about 15 million per year.
- The main perinatal outcomes assessed within the unmatched cohort, event rates were higher among antipsychotic users than non-users for preterm birth (14.8% v 10.3%) and birth weight >97th centile (3.7% v 2.6%).
- According to the study by Berard women's exposed to C0X-2 inhibitors and NSAIDs during pregnancy is associated with 1.65-fold of risk of PTB.
- According to the Substance Abuse and Mental Health Services Administration's National Survey on Drug Use and Health, 5.4 percent of pregnant women between ages 18-44 had used OTC drugs during their first trimester, 4.8 percent in their second trimester, and 2.4 percent in the last trimester of pregnancy.



Outcomes and antipsychotic use	No of users	No (%) of events
Preterm birth (<37 weeks)		
Any atypical antipsychotic	923	136 (14.7)
Quetiapine only	556	87 (15.6)
Olanzapine only	166	22 (13.3)
Risperidone only	112	15 (13.4)
Small for gestational age (<3rd centile)		
Any atypical antipsychotic	923	55 (6.0)
Quetiapine only	556	31 (5.7)
Olanzapine only	166	13 (7.9)†
Risperidone only	112	‡
Large for gestational age (>97th centile)		
Any atypical antipsychotic	923	35 (3.8)
Quetiapine only	556	22 (4.0)
Olanzapine only	166	‡
Risperidone only	112	‡

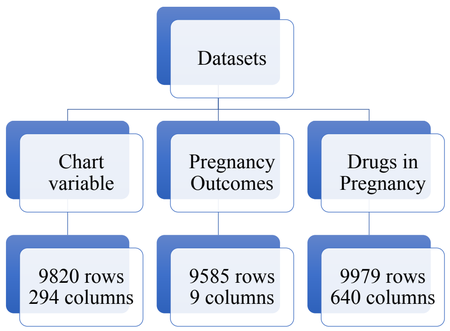
Adjusted relative risk (95% CI)*

* Adjusted for a prescribed selective serotonin reuptake inhibitor (SSRI), non-SSRI, mood stabiliser, and/or benzodiazepine medication during the index pregnancy
† Crude relative risks presented because so few events
‡ Event rates and/or relative risks are too low to report

Objectives

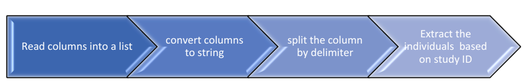
- The main aim of the study is to identify the impact of prescription drugs on the pregnancy outcomes especially conditions like birth weight, stillbirth, live birth, and gestational age.
- The purpose of the project is to tell with confidence that a patient pregnancy outcome is associated with defects or non- defect.

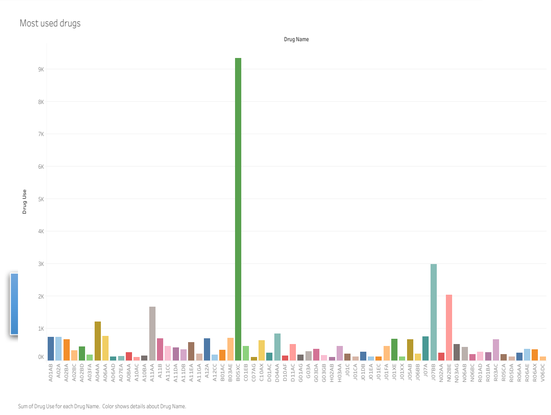
Methodology

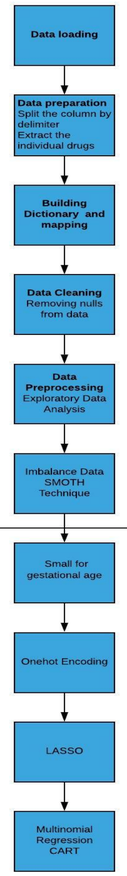


Inclusion criteria:
Pregnancy women with outcomes associated with weight, birth and gestational weeks

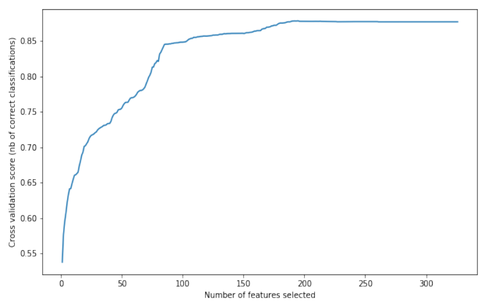
Exclusion Criteria:
Vaccines and vitamin medications are removed from the final dataset



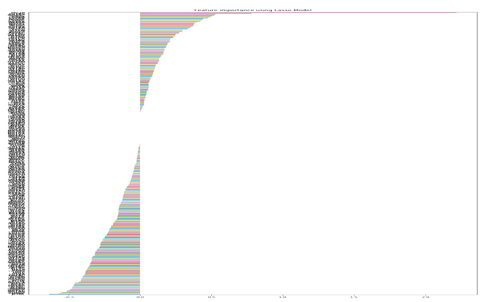




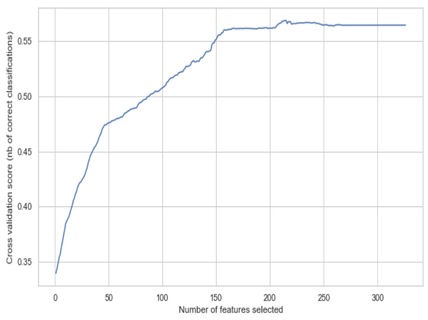
Results



Pregnancy Outcome: Feature selection (Optimal number of features: 193)

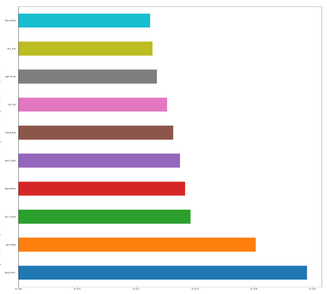


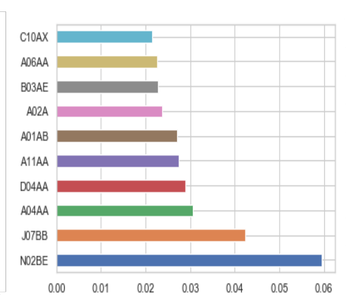
Gestational Age: Feature selection (Optimal number of features: 125)

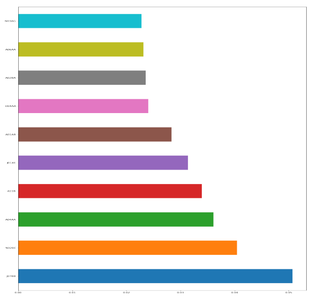


Birth Weight: Feature selection (Optimal number of features: 215)

Top 10 Features for Pregnancy Outcomes:







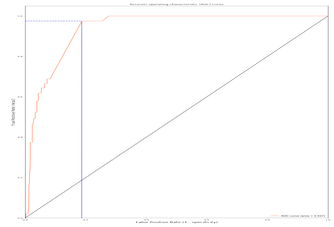
Model accuracy:

Random Forest(Gestational Age)

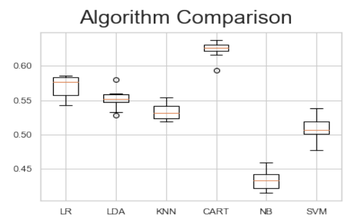
```
Confusion matrix:
 [[1471  228]
 [ 377 1377]]

Accuracy: 0.8247900376484216
```

Logistic Regression(Live/Still Birth)

```
Confusion matrix:
 [[1492  370]
 [  60 1838]]
```



Multinomial Regression(Birth Weight)




```
0.6153631284916201
[[675 532  28]
 [195 937  30]
 [241 351 591]]
              precision    recall  f1-score   support

           0       0.61      0.55      0.58      1235
           1       0.51      0.81      0.63      1162
           2       0.91      0.50      0.65      1183

   micro avg       0.62      0.62      0.62      3580
   macro avg       0.68      0.62      0.62      3580
weighted avg       0.68      0.62      0.62      3580
```

Discussion

- Mediations of antiepileptic, Anti-Bacterial, Analgesics and Antipyretics, Lipid modifying agents, Stomatological preparations and Cardiovascular drugs have impact on pregnancy outcomes
- Live/Still birth logistic model accuracy is 94%
- Multinomial regression approach for birth weight yields best accuracy for CART regression 62%
- Random Forest regression model predicts 83% accuracy for gestational age(preterm/full term birth)
- Pregnancy women drug intake pattern varies from 4 to 10 with highest still and live birth outcomes

Conclusion

- Research identifies the medications and its impact on the various pregnancy outcomes
- Development of a clinical decision support system that contains information on safety and secure rating of drugs in pregnancy and to progress clinical outcomes
- Further research on the individual drugs with ATC 5 level hierarchy can be performed

References

- Bérard, A., Sheehy, O., Girard, S., Zhao, J. P., & Bernatsky, S. (2018). Risk of preterm birth following late pregnancy exposure to NSAIDs or COX-2 inhibitors. Pain, 159(5), 948-955.