Champaign County Crash:

Cause of Severity

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Outline

- Recap & Additional Statistic
- Research Question & Data Modelling
  - Severe Crash vs. Traffic Crime
  - Bike Severe Crash - Distance
  - Pedestrian Severe Crash - Light
- Conclusion

Recap: Factors affect severe crash

Bike Crash

City	Severe	Non-Severe
Unincorporated	21	35
City Area	165	612
Odds Ratio/ 95% CI	2.22	[1.19, 4.05]

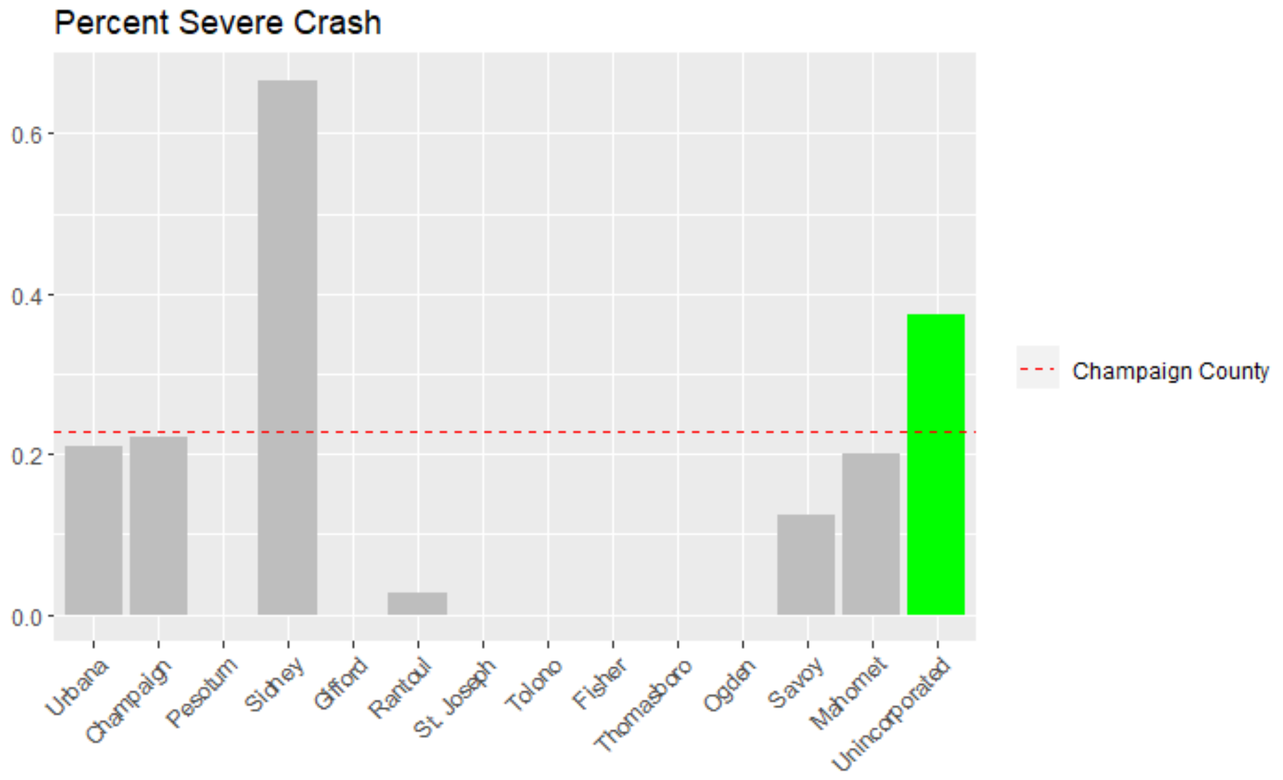
Pedestrian Crash

Light	Severe	Non-Severe
Bad	62	74
Good	210	397
Odds Ratio/ 95% CI	1.58	[1.07, 2.35]

Does unincorporated area really affect crash severity?

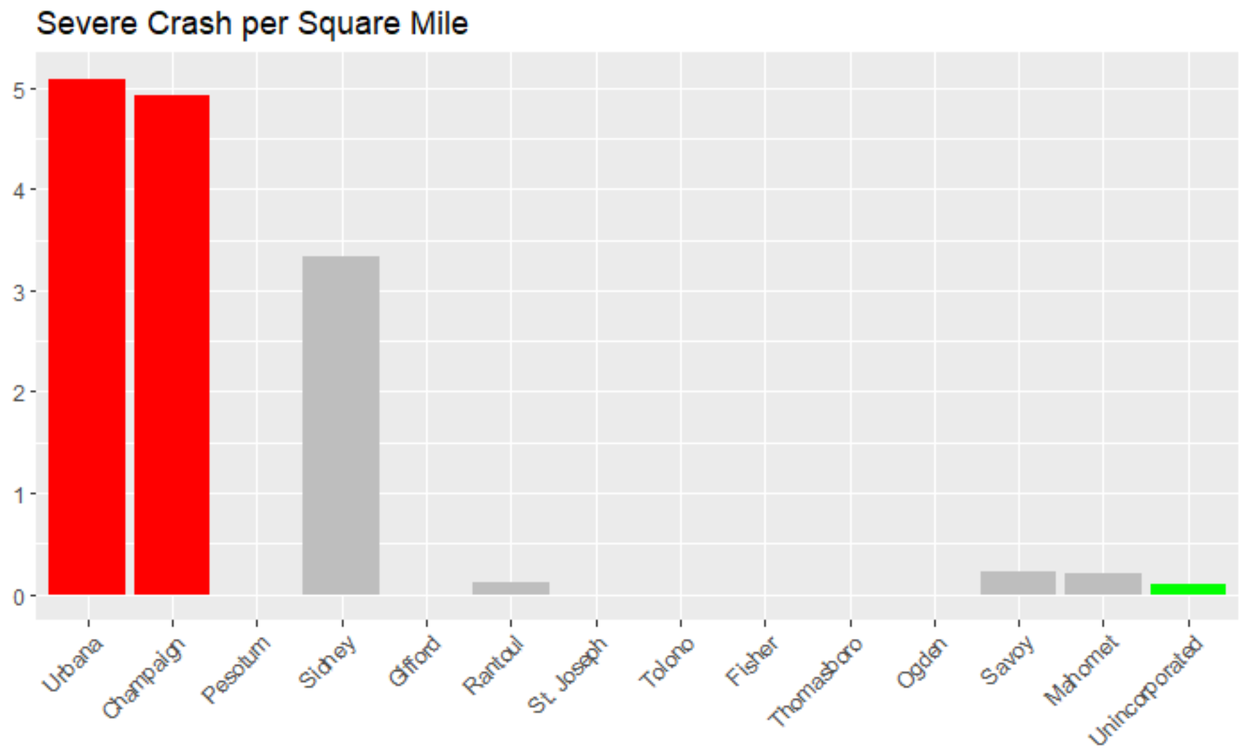
If not, what does?

Percentage of Severe Bike Crash



Data: 2005 – 2020
Sidney is outlier. There are 3 crashes and 2 of them are severe.

Severe Bike Crash Per Sq Mile



City	Sq Mile
Champaign	22.5
Urbana	10.8
Unincorporated Area	215.2

Data: 2005 – 2020

1. Severe Crash vs. Traffic Crime

Top 10 Traffic Crimes

2005 – 2020

Group	Crime Description
SPEED	Speeding (RADAR), Failure to Reduce Speed
TF_SIGN	Traffic Sign Violation
VOICE_COMMU	Electronic Communication-Voice
LICENSE	Operate Uninsured Motor Vehicle, No Valid DL Drivers License
LANE	Improper Lane Usage
LIGHT	Driving Without Light, Improper Lighting/One Headlight
BELT	Seat Belt-Driver & Passenger

Ideal Regression Line

- Focus only on Urbana Crash

- 16 Observations by year (2005 – 2020) – Count of each variable in each year.

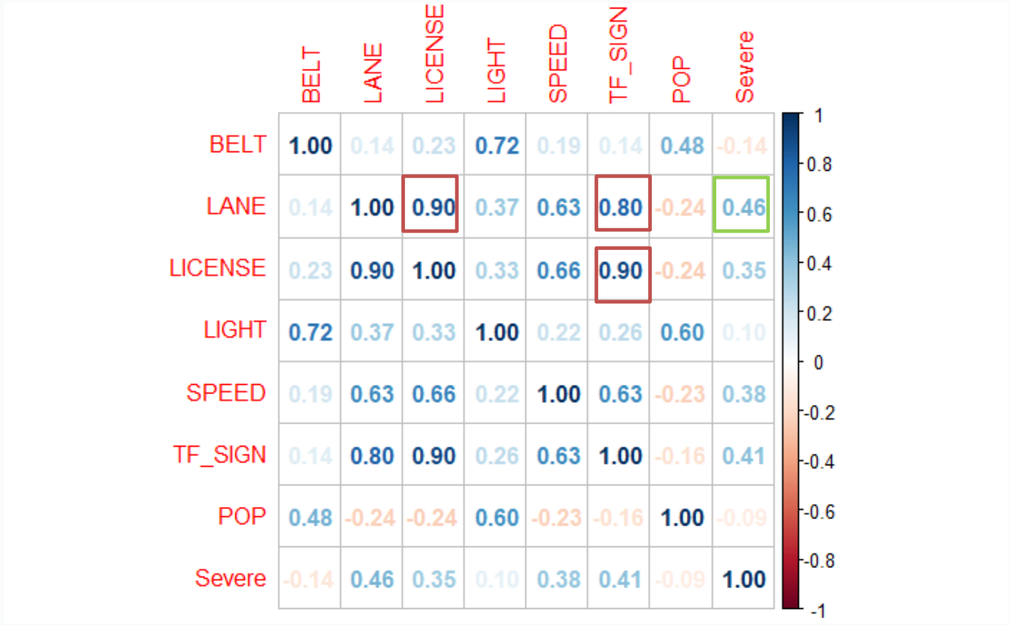
Severe ~ SPEED + TF_SIGN + VOICE_COMMU + LICENSE + LANE + LIGHT + BELT + POPULATION

- Mean Severe Crash: 3.44
- Variance: 6.66

1. Severe Crash vs. Traffic Crime

Check Multicollinearity

Correlation Matrix



Initial Regression Line

Severe ~ SPEED + LANE + LIGHT + BELT + POPULATION

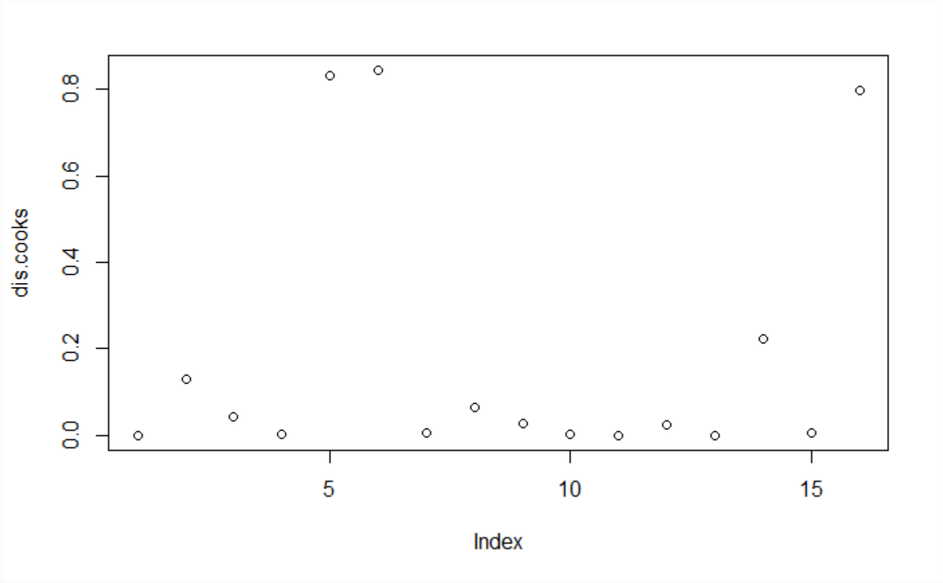
- Remove VOICE_COMMU because it started in 2014
- Remove TF_SIGN and LICENSE because they have high correlation with LANE

- No significant predictor
- Adjusted R Square: -0.03
- RMSE: 2.06

1. Severe Crash vs. Traffic Crime

Influential Observations

- No Influential (cook's distance > 1)



Backward Selection

Severe ~ LANE

- Intercept: -2.79 (insignificant)
- Beta_Lane : 0.03, P-value: 0.07
- R Square: 0.21
- Adjusted R Square: 0.16
- RMSE: 2.21

2. Bike Severe Crash - Distance

Detail

- Distance: from Green & Wright in Km.
- City: only Champaign & Urbana
- Do not check multicollinearity because there are categorical variables
- Logistic Regression

Severe ~ dist_km + light_group + weather_group + surface_group + traffic_group

Result

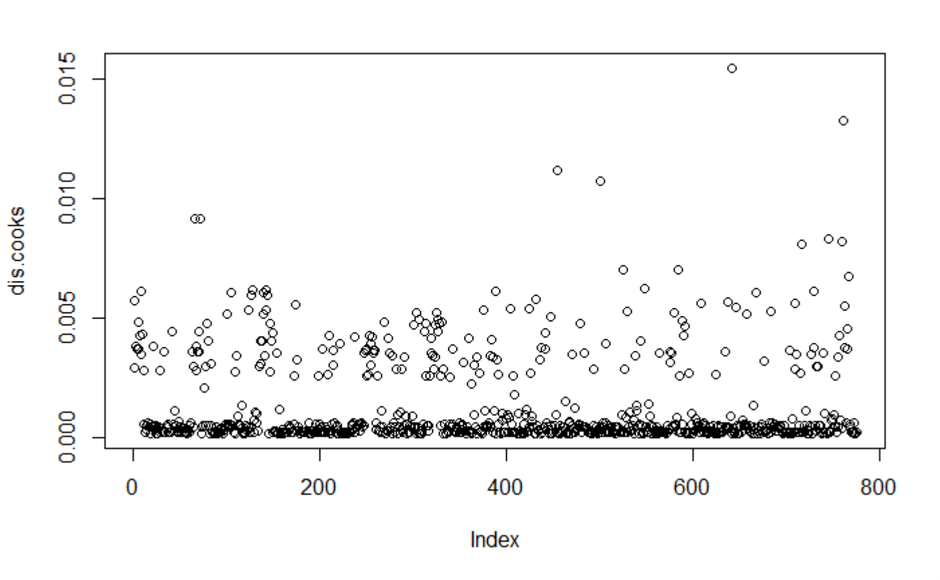
Group	Coefficient	P > (Chi)
Intercept	-1.70	
dist_km	0.08	0.12
light_group	0.12	0.89
weather_group	-0.12	0.61
surface_group	0.37	0.26
traffic_group	0.34	0.06

- No significant variable
- Adjusted R Square: 0.006

2. Bike Severe Crash - Distance

Influential Observations

- No Influential (cook's distance > 1)



Backward Selection

Group	Coefficient	P > (Chi)
Intercept	-1.55	
dist_km	0.09	0.12
traffic_group	0.34	0.05

- AUC: 0.5
- Adjusted R Square: 0.006

Predicted/ Actual	Non-Severe	Severe
Non-Severe	598	177
Severe	-	-

Distance in term of On Campus/Off Campus does not work as well

3. Pedestrian Severe Crash - Light

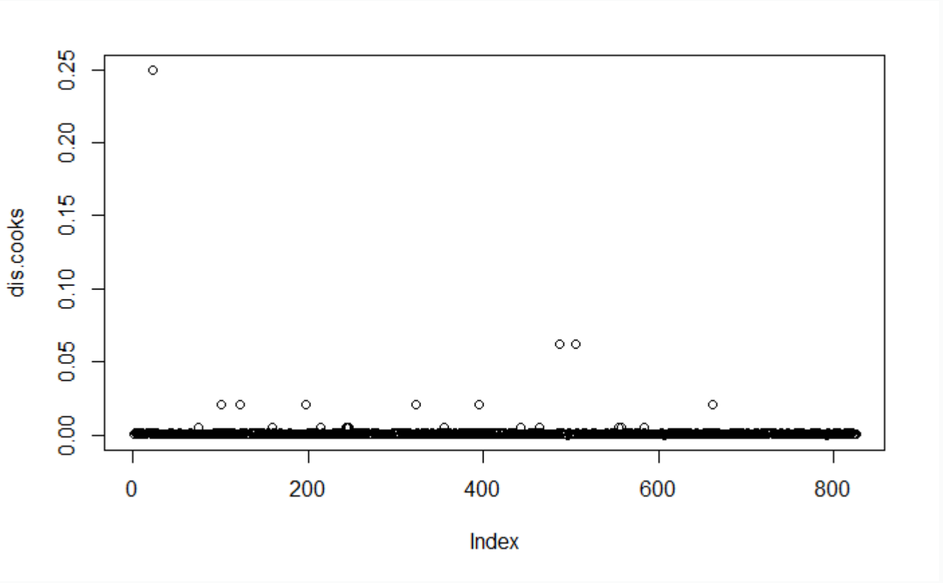
Detail

- Logistic Regression
- Do not check multicollinearity in categorical variables
- 5 Light Categories: Darkness, Dawn, Daylight, Dusk, Lighted Road, Unknown

Severe ~ Light

Influential Observation

- No Influential (cook's distance > 1)



3. Pedestrian Severe Crash - Light

Forward Selection

- Severe ~ Light

- AUC: 0.54
- Adjusted R Square: 0.007
- Misclassification: 0.38

Predicted/ Actual	Non-Severe	Severe
Non-Severe	448	249
Severe	63	65

Tukey Pairwise Test

Pairwise	Diff	P - Value
Daylight - Darkness	-0.14	0.032
Lighted Road - Darkness	-0.16	0.052
Other		0>0.4

Summary

- Bike and Pedestrian Crash could be predicted well by variables given in this data set.
- Daylight and Lighted Road have less possibility of severe crash than Darkness at 5% and 10% significant level. But we cannot conclude statistically about Dusk, Dawn and Unknown.

What's next?

- Find other way to utilize location variable.
- Find other dataset to help predict severity crash.

Thank you for listening