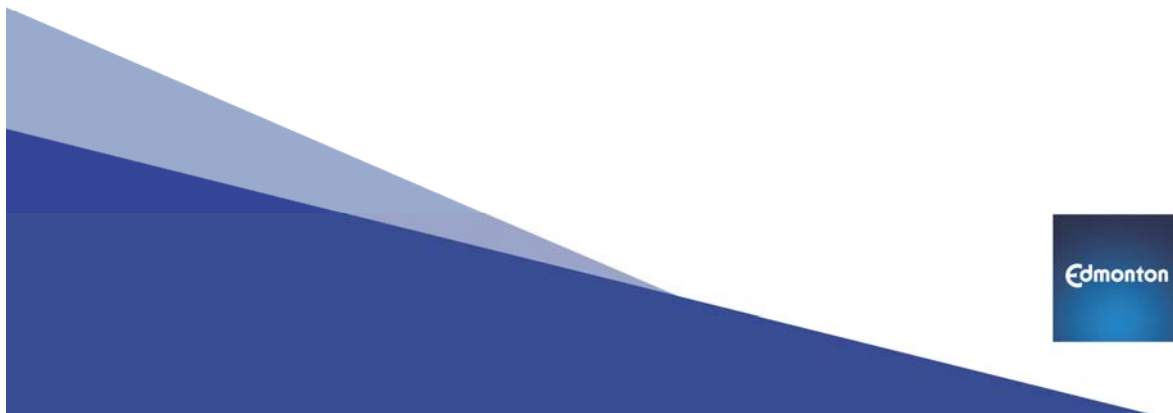


Analytics on Crime Data and Number of Liquor Stores in Edmonton

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EXECUTIVE SUMMARY

The analytics prepared by the Analytics Centre of Excellence (ACE) using crime, population and liquor store data indicate that there is no significant linear relationship between the number of liquor stores and the rate of relevant crime incidents (crime rate)¹. The sample data used in this study is comprised of the number of liquor stores per neighbourhood and relevant incidents of crime between January 1, 2012, and December 31, 2015, normalized by neighbourhood population. It should be noted the analytics findings do not refute the broader effect of alcohol abuse on society. Instead, the findings of this study indicate there is no significant linear relationship between the presence of liquor stores and incidents of crime in neighbourhoods throughout Edmonton.

¹ The crime data is filtered using categories that may directly relate to liquor abuse (see the data preprocessing section for more information).

BACKGROUND

In 2007, Zoning Bylaw 12800 was amended to include a requirement for a 500 metre separation distance between Alcohol Sales uses (liquor stores). The 500 metre separation distance was introduced to limit the concentration of liquor stores along established commercial shopping corridors, such as Jasper Avenue, Whyte Avenue, 107 Avenue, Stony Plain Road, 118 Avenue and 97 Street.

At the February 3, 2015, Executive Committee meeting, members of City Council directed Administration to provide recommendations for possible Zoning Bylaw 12800 amendments to create an exemption from restrictions on the 500 metre separation distances between liquor stores for larger commercial sites, in suburban contexts.

The objective of Edmonton's Analytic Centre of Excellence research is to determine if a relationship exists between the concentration of liquor stores and the incidence of crime in Edmonton.

ANALYTICS OBJECTIVES

1. to use regression analysis to explore potential relationship between crime data and the dependent variables including population and number of liquor stores.
2. to create interactive dashboards to explore variables individually and in aggregated forms to support data driven decision making.

DATA PREPROCESSING

· Filtered crime data between January 1, 2012, and December 31, 2015, from nineteen Edmonton Police Service response categories based on the input from planners in Development Services. The categories include:

1. Child Welfare Act
2. Family Disputes Intimate Partner
3. Family Disputes Violence
4. Family Related Occurrence
5. Impaired Driving
6. Mental Health Act Complaints
7. Liquor Act General
8. Suicide Attempt
9. Deaths Suicide
10. Impaired Driving Bodily Harm
11. Impaired Driving Death
12. Family Disputes
13. Impaired Operation (alcohol) vehicle, vessel, aircraft
14. Mental Health Act
15. Liquor Act Generally
16. Suicides
17. Impaired Operation (alcohol) – causing bodily harm
18. Attempted Suicides
19. Minor – Obtain Liquor

- Aggregated incidents of crime per neighbourhood.
- Extracted liquor stores data using Business License and Development Permit data from 2012 to present.
- Extracted geolocation of liquor stores using Google Application Programming Interfaces (APIs) based on Development Permit addresses, and aggregated data per neighbourhood.
- Extracted neighbourhood population data from 2014 municipal census
- Computed crime rate per neighbourhood using

$$\text{neighbourhood crime rate} = \frac{\text{number of relevant incidents of crime per neighbourhood}}{\text{neighbourhood population}}$$

METHOD

To test if there is a significant linear relationship between number of crime incidents and number of liquor stores. Hypothesis testing was conducted using a linear regression t-test.

The test procedure consists of four steps:

1. HYPOTHESES:

If there is a significant linear relationship between the number of liquor stores and crime rate then

$$\text{crime} = \beta_0 + (\beta_1 * \text{number of liquor stores})$$

β_0 = Intercept

β_1 = Slope

- The null hypothesis is that there is no relationship between number of liquor stores and incidents of crime (slope equal to zero thus $H_0: \beta_1 = 0$)
- The alternative hypothesis is that the number of liquor stores affects the incidents of crime (slope is not equal to zero thus $H_1: \beta_1 \neq 0$)

2. ANALYSIS PLAN:

- A significance level of 0.01 was used as the threshold for the probability of committing a Type I error (the probability of incorrectly rejecting the null hypothesis)
 - A linear regression t-test was used to determine if the slope of the regression is non-zero

3. RESULTS

	coefficient	t	P-value	Standard error
slope (B_1)	5.4133	2.123	0.034	2.549
intercept (B_0)	18.9313	5.268	0.000	3.594

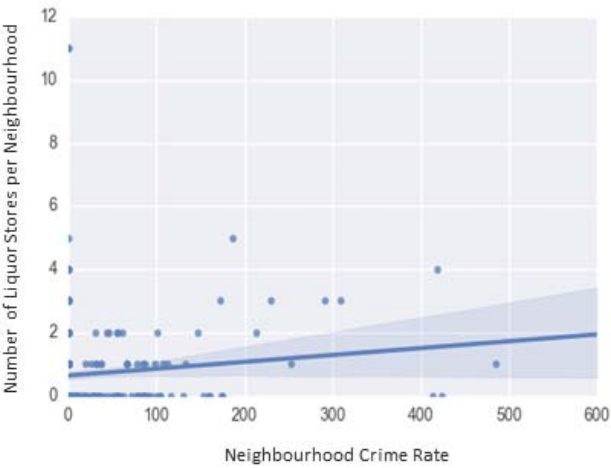
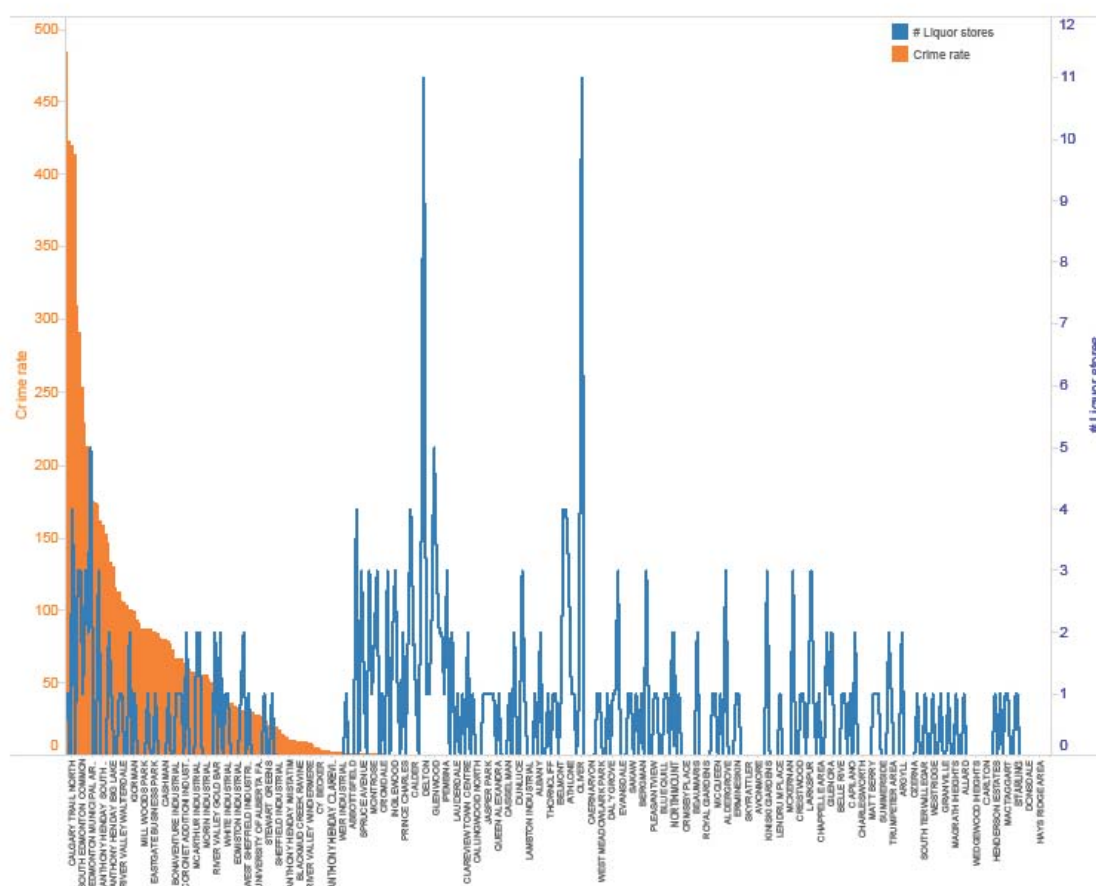


Figure 1: The regression line shows that it is challenging to fit a line to sample data on number of liquor stores per neighbourhood and neighbourhood crime rate in Edmonton



4. INTERPRETING RESULTS

The results show that the P-value is greater than the threshold (i.e. P-value of 1%), therefore we cannot reject the null hypothesis. We conclude that there is no significant relationship between the number of liquor stores and neighbourhood crime rate in our sample data.

² The crime data is filtered using categories that may directly relate to liquor abuse (see the data preprocessing section for more information).

CONCLUSION

Based on regression analysis of crime, population and liquor store data we conclude that there is no significant linear relationship between the number of liquor stores and neighbourhood crime rate².