

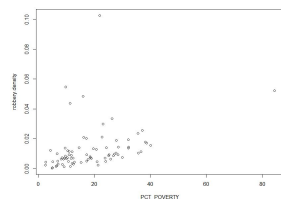
Public Infrastructure and Robbery Rates in Denver

Cara You, Yuting Song, Yang Cheng, Tim Wetzel

Introduction

Denver's crime rate is large compared to other cities in Colorado and throughout the United States. From data in 2016, the crime rate in Denver is approximately 4 times that of Colorado as a whole. The population of Denver is ballooning and without the right infrastructure to support the population, there is cause for concern. How can we better understand how public infrastructure is linked to increased robbery rates? We chose to take an approach based on neighborhood characteristics, and specifically public infrastructure. We focused on many potential variables related to public safety, education, and recreation that may have had a strong relationship with robbery, and arrived at a select few with very significant linkage: our variables related to police stations, bike racks, and HeadStart programs. There are other regressors in our model that have a substantial effect on robbery rates in Denver neighborhoods, specifically those relating to the number of colleges offering bachelor's degrees, the percentage of residents in poverty, and the proportion of residents renting a house.

Poverty Rate v. Robbery Rate

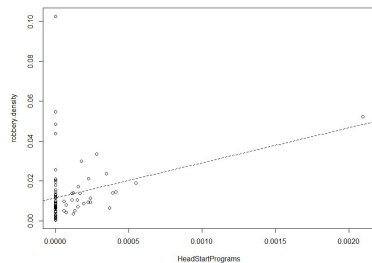


Here there is a distinct positive correlation between this regressor and the response.

Methods

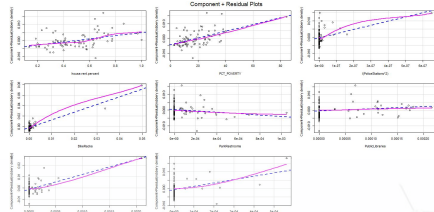
To explore the relationship between public infrastructure and robbery rates, we created a linear regression model. This begins with targeting potential variables to include in our model (e.g. density of police stations, percent of residents in poverty) and performing regressor amputation to find a core set of explanatory variables based on the observed data. This is done via multicollinearity checks and model selection using various information criteria. We also evaluated model structure using a multitude of plots (residual, marginal model, etc.) to validate our choice in regressor variables. Finally, any points that were massively influential in model structure were removed if they negatively impacted fit.

HeadStart Program Density v. Robbery Rate



Presence of HeadStart programs in Denver neighborhoods are associated with higher robbery rates.

Plots Highlighting Model Structure



Conclusions and Results

We arrived at a linear model consisting of variables related to the following neighborhood characteristics (in order of significance):

- Bike racks
- HeadStart programs
- Police stations
- Poverty
- Rental properties
- Colleges
- Public libraries
- Park restrooms

All regressors that made their way into our final model were associated with an increase in robbery rates, excepting park restrooms. Many variables were not able to be accounted for in our model, and these variables are likely to be correlated with the predictors and the response, and hence we cannot make a causal argument. There are also issues of reverse causality to be considered. For instance, it is likely that higher crime rates lead to higher prevalence of police stations.

Policy Implications

Because police stations are highly correlated with robbery rates, perhaps we can try to improve the police station efficiency, such as to punish robbery more severely in order to prevent future robberies from being committed. Because HeadStart programs, poverty rate, and colleges offering bachelor's degrees have high correlation with robbery density, we can also increase the police force in the neighborhoods where these institutions are present.

The presence of bike racks is also highly correlated with robbery. While we do not have sufficient evidence to causally link this with robbery, perhaps we can improve bike rack construction quality and design. We could also educate bike owners about how to sufficiently lock their bike, and even implement a mobile application to aid bike owners in tracking their bikes (a strategy which has been implemented in other metropolitan areas).

Finally, policy makers might work to make permanent housing more affordable in an effort to reduce the number of families renting their home. Rented properties are associated with a higher rate of robbery, and establishing a more permanent community that is in the neighborhood may combat this.

Bibliography

- 1 Denver, Post. "Robbery 2018 Crime Report." *The Denver Post*, 2018, [crime.denverpost.com/crime/robbery/#charts](https://www.denverpost.com/crime/robbery/#charts).
- 2 Babin, Tom. "Bike Theft Is Not Inevitable." *The Guardian*, 7 Nov. 2017, www.theguardian.com/cities/2017/nov/07/theft-bike-a-pv-vancouver-project-529-j-allard-xbox.
- 3 "Compact Flat Pack 4 Bike Rack." *Securabike US*, 2018, www.securabike.com/shop/compact-bike-rack-flat-pack.