DATA TO POLICY PROJECT
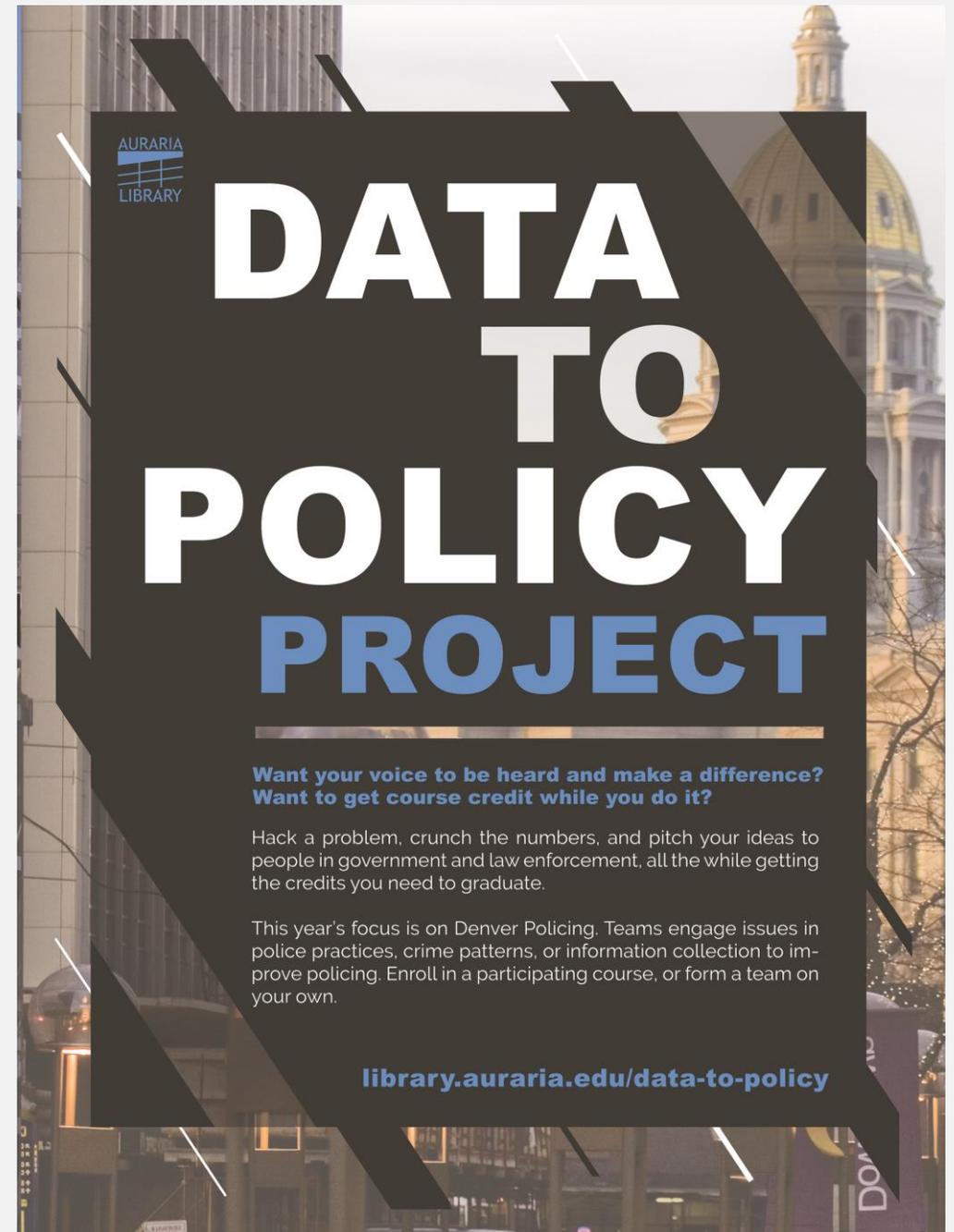
Using real data to solve real problems

INSPIRATION

Giving students a constructive voice to respond to police shootings

AURARIA
LIBRARY

DATA TO POLICY
PROJECT

**Want your voice to be heard and make a difference?
Want to get course credit while you do it?**

Hack a problem, crunch the numbers, and pitch your ideas to people in government and law enforcement, all the while getting the credits you need to graduate.

This year's focus is on Denver Policing. Teams engage issues in police practices, crime patterns, or information collection to improve policing. Enroll in a participating course, or form a team on your own.

library.auraria.edu/data-to-policy

TOPICS

2017-2018:
- Policing
  - Patterns in Crime
  - Policing Practices
  - Information Collection

2018-2019:
- Policing
- Affordable Housing

2019-onward:

Public Data for Public Good

PANELS AND SYMPOSIUMS

Photo: Matt Mariner

"POLICING PRACTICES" WINNING TEAM

Alexa Desautels

Christina Ebben

Anna Gibala

Joshua Luginbill

Optimized Allocation of Police Officers in Denver County

University of Colorado Denver
CU IN THE CITY

Authors: Alexa Desautels, Christina Ebben, Anna Gibala, Joshua Luginbill

Abstract

Police presence is known to be a key factor in reducing violent crime in an area. However, the question of where officers should be located, and in what quantity, in order to best reduce violent crime is rarely trivial. In this work, we propose an Integer Linear Programming formulation for the optimization of police officer allocation across police districts in Denver County. This allocation takes into account the population, budget, number of officers, and violent crime data for Denver County from 2014. Moreover, we demonstrate how our allocation will be affected by changes to the budget and number of officers employed.

Objective

- Objective Function with Constraints

$$max \sum_{i=1}^{m} s_i x_i$$

Maximize the number of police officers in district i relative to the number of crime occurrences

$$\sum_{i=1}^{m} x_i \leq N$$

The number of officers cannot exceed the total number of available

$$f_i \leq x_i \leq h_i$$

The number of officers should be between the minimum and the ideal number

$$c_i x_i \leq b_i$$

The cost of officers cannot exceed the budget in district i
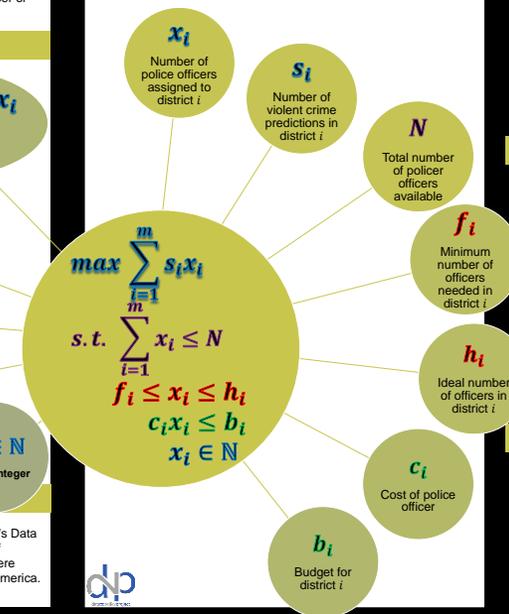
$$x_i \in \mathbb{N}$$

X is an integer

Background

This work was motivated by the University of Colorado Denver's Data to Policy project. Our methodology was inspired by the proof of concept proposed by Cavadas et. al. in which police officers were optimally distributed across the states of the United States of America.

Methods

Given the violent crime data for 2014, we propose to optimize the allocation of police officers across police districts. We considered a certain number of officers to distribute, taking into account violent crime data to allocate more officers to districts where more violent crime occurred. The allocation is constrained by an "ideal number" of officers that each district would like to receive and a budget for each district. Additionally, each district must receive a minimum number of officers needed to ensure basic public safety.

x_i — Number of police officers assigned to district i

s_i — Number of violent crime predictions in district i

N — Total number of police officers available

f_i — Minimum number of officers needed in district i

h_i — Ideal number of officers in district i

c_i — Cost of police officer

b_i — Budget for district i

$$max \sum_{i=1}^{m} s_i x_i$$
$$s.t. \sum_{i=1}^{m} x_i \leq N$$
$$f_i \leq x_i \leq h_i$$
$$c_i x_i \leq b_i$$
$$x_i \in \mathbb{N}$$

Results

Below are the results of our model using data from 2014.
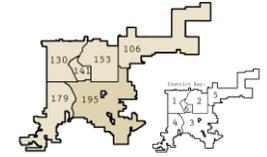
District	Crime Rate	Min. Officers	Ideal Officers	Budget	Officer Allocation
1	624	56	344	19,980,962.41	130
2	677	72	442	23,529,489.06	153
3	595	121	736	29,937,017.13	195
4	715	92	553	27,409,422.34	179
5	526	44	296	16,275,719.34	106
6	861	41	252	21,658,895	141
Total	3997	426	2,606	138,791,485.10	904

Policy Recommendations

Below are the results of our model when budget is increased to an "ideal", albeit unrealistic, number.

District	Budget	Officer Allocation
1	8,5598,24.00	56
2	11,005,488.00	72
3	18,495,334.00	121
4	55,486,002.00	363
5	6,725,576.00	44
6	38,519,208.00	252
Total	138,791,432.00	908
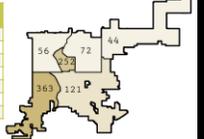
District 6 has the highest priority for police officer allocation. Officers should be placed in district 6 at the expense of other districts until the "ideal number" of officers has been met. At that point, any additional officers should be allocated to district 4 while districts 1, 2, 3, and 5 should receive only the minimum number of officers required to guarantee basic public safety.

References

- Police employment, officers per capita rates for u.s. cities. Governing, 2016.
- Bruno Cavadas, Paula Branco, and S´ergio Pereira. Crime prediction using regression and resources optimization. Lecture Notes in Computer Science, 2015.
- City and Denver Police Department/Data Analysis Unit County of Denver. Crime. 2018.
- Michael B. Hancock. City and County of Denver Mayor's Proposed 2015 Budget. City and County of Denver, 2014.
- Chief Robert C. White. 2014 annual report denver police department. pages 6–27, 2014.6–27, 2014.

drcog DENVER REGIONAL COUNCIL OF GOVERNMENTS AND **dp** datatopolicyproject

- Data!

- Government/Community questions   Community Question Submissions

- Student analysis & policy work can contribute to local government

- Bridge between students and employers

INTERDISCIPLINARY VISION

Real-world context for learning

STEM students think about Policy

Policy students get comfortable with STEM

datatopolicyproject

DATA TO POLICY WEBSITE

https://library.auraria.edu/d2pproject

D2P RESOURCES

Policy Practitioner Opportunities!

- Videos
- Guest lecture
- Mentor

Get Data

Access a spreadsheet for suggested data resources that can contribute to your project. Pursue other sources on your own to supplement as you'd like, but please cite any data you use in your analysis.

Get Data

Get Context

Data analysis is highly susceptible to misinterpretation and misuse. Relationships between communities of color, law enforcement, and housing policies have a complex and often contentious history.

D2P has compiled a list of resources to help provide some background on these relationships to help deepen understanding of the issues being addressed by D2P projects.

Get Context

Get Links

These websites will provide useful background, data and/or tools for your projects.

Get Links

HOW TO GET INVOLVED

datatopolicyproject

- Attend the symposium!

  Dec. 4th

  9am at the Lawrence Street Center's Terrace Room

- Volunteer as a judge for the symposium

- Submit questions   Community Question Submissions

- Be a video star! (Or just visit a class)

- Mentor a promising project

CONTACT - D2P COMMITTEE

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